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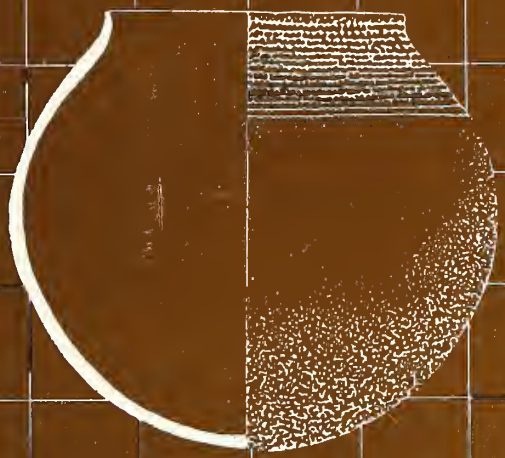

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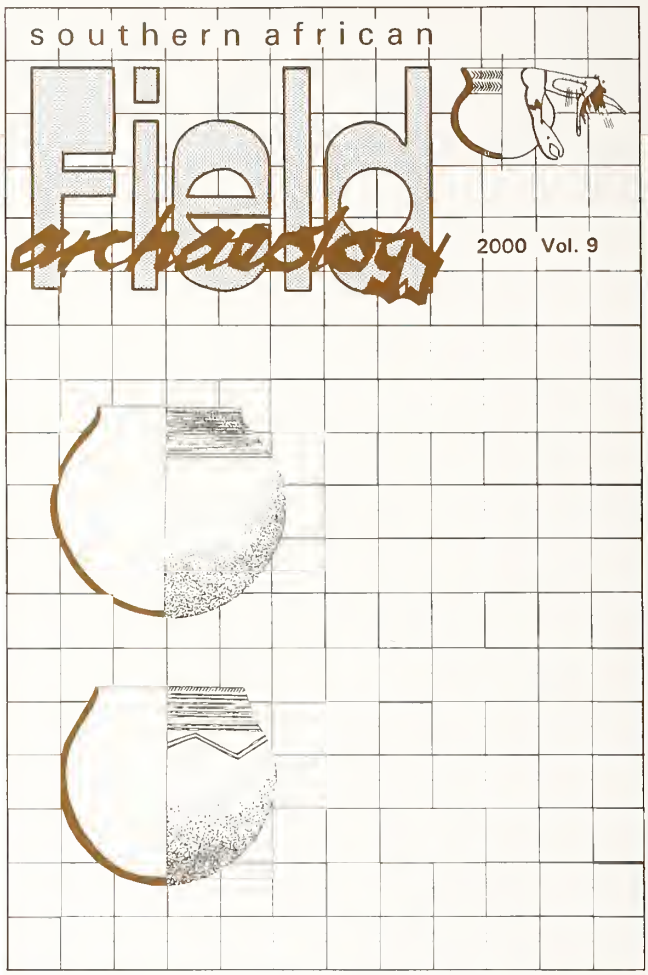

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Ceramic vessels from a Late Iron Age site in the Makgabeng area, Northern Province, p. 75

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OPINIONS

INDIGENOUS INTELLECTUAL PROPERTY RIGHTS AND ARCHAEOLOGICAL INVOLVEMENT: ARE WE PREPARED FOR THE CHALLENGE?

A previous columnist has highlighted the role of "intellectual property rights" in the context of indigenous claims to the cultural heritage of South Africa (Ouzman 1999:57-59). Towards the end of this interesting article a plea was made for more partnerships between indigenous systems of archaeological knowledge and non-indigenous archaeology in order to aid in the de-colonisation of archaeology as a discipline (*ibid*). Elsewhere post-colonial societies such as Australia, New Zealand, and Canada saw major changes surrounding long-standing claims for indigenous rights to land and cultural heritage towards the closing decades of the 20th century. These changes have dramatically affected the way in which archaeology is conducted in those countries. Accelerating developments have forced archaeologists and the bureaucracies which govern their work to become increasingly aware of indigenous people's sensitivities about archaeological activities, particularly those concerning human skeletal remains, special places on the land, cultural artefacts, and rock art (Lilley 2000). The very recent interest in Khoisan skeletal remains in South African museums (Ouzman 1999; Legassick & Rasool 2000) is a direct outflow of a

larger international movement.

An immediate and obvious question would be one of identifying legitimate indigenous identities. Who are indigenous in the South Africa context? The present South African government regards all peoples or their descendants who lived in South Africa prior to European colonialisation as indigenous. From an international perspective there is no clear definition of the concept of 'indigenous peoples'. It is a collective term that has come into usage fairly recently. It is only as recent as 1993 that the United Nations Working Group on Indigenous Peoples prepared a draft declaration on the "rights of indigenous peoples" which were adopted in 1994 by the UN sub-commission and passed on to the Commission on Human Rights. The draft declaration dealt with the areas of self-determination, language and culture, and intellectual and cultural property. Before this period most national policies were based on an ideal of assimilation and the merging of cultures into a dominant mainstream of thought.

In the most general terms, 'indigenous peoples' are distinct peoples with their own languages, cultures and territories, who have lived in a country since times far prior to the formation of the current nation state. They have become marginalised in their own lands by more assertive groups of different cultural and ethnic origin, or have been driven off their lands by force. The peoples concerned strongly resist being defined by others and use their own names to designate themselves, such as the Ainu, Saami, Inuit, Dine, Maori, Naga and Ju'hoansi (Staehelin 2001).

The term 'indigenous people' is clearly more complicated when referring to the African situation. The case for "indigenousness" is clear in Australia and the Americas, where peoples had occupied their territories exclusively before colonialisation by Europeans and where they are politically marginalised. It can therefore be argued that all black Africans were indigenous during the colonial era, when they were subject to white domination (Maybury-Lewis 1999:3). Unlike other indigenous peoples, however, black Africans are in political power today and represent the majority population in most nation states of modern Africa. In fact, indigenous minorities such as the San and Khoe of southern Africa and the aBatwa of central Africa today have more in common with indigenous peoples elsewhere in the world than do the majority black African population. Non-Governmental Organizations and writers often used the terms "First Peoples", "First Nations", "First Indigenous Peoples", and/or indigenous minorities to distinguish these peoples from the majority populations in the African context. However, most African governments do not officially endorse these distinctions. This is perhaps most evident in the case of Botswana where it's large San population has been officially designated, as "Remote Area Dwellers" (RAD's) - a term which refers to all people, San and others, living outside of villages in rural areas. This term is indicative of the efforts of the Botswana government to avoid identifying people on the basis of their ethnicity, in a clear break from the basis of apartheid terminology (Hitchcock 1998). It is also indicative of an ambivalent attitude towards recognizing San culture and intellectual property rights. Given the recent apartheid-era history of South Africa and the present mandate on nation building it is not surprising that ethnic divisions are not particularly emphasized by the South African government. However, the concept of indigeneity is clearly important as is evident in the high priority given to "Indigenous Knowledge Systems" (IKS) as a focus area of research by the National Research Foundation (NRF) and the recent incorporation of a southern San rock painting in the country's Coat of Arms. South Africa has also recognized the cultural rights of its indigenous minorities in her constitution (Section 6.2 and 6.5). In 1998 the government officially sanctioned indigenous minority issues with the launch of the Khoisan Legacy Project. These developments are in line with the United Nations affirmation of the special rights of indigenous minorities which states that:

> for indigenous people all over the world the protection of their cultural and intellectual property has taken on growing importance and urgency. They cannot exercise their fundamental human rights as distinct nations, societies and peoples without the ability to control the knowledge they have inherited from their ancestors (United Nations 1997).

Where does this leave the archaeological fraternity in South Africa? As Ouzman (1999) so clearly states South Africa's majority Black population is, by and large, dismissive of the limited leverage archaeology is able to offer them. It has predominantly been the dis-empowered minority groups, and by implication the various Khoisan organizations, which have been using versions of the past (theirs and those presented by archaeologists and other academics) to publicly air their concerns. This process was initiated by the *Miscast Exhibit* in 1995, and the *Khoisan Identities and Cultural Heritage Conference* in 1997. With the establishment of the Khoisan Legacy Project and the Khoisan National Committee in 1998 Khoisan groups began to take control of their own identity, indigenous knowledge, and intellectual property. In fact, recent years has seen a plethora of groups and individuals claiming indigenous minority or "First People" status. Although some of these have demonstrable historical links with known indigenous groups in the past others are less clearly defined. As these former subjects of colonial and post-apartheid governments seek to recover and assert their ethnic distinctiveness, they quite naturally turn to those elements that are perceived as being the most authentic and the apparent essences of their culture. Elsewhere the academic fraternity has often taken a paternalistic and subtly contemptuous view of this sort of essentialism. Most appear to support the philosophy of indigenous self-determination while proffering constructivist critiques that undermine their subjects notions of cultural authenticity (Watanabe 1995). At the same time, their irony and word plays often leave their audiences

unsure of exactly where they stand politically and thus provide a safeguard against attacks on their work. Such safeguards may become increasingly important for the archaeological fraternity, as the descendants of past societies researched by archaeologists are ever more likely to be the consumers of archaeological writings.

Interestingly, in South Africa archaeologists have generally been reluctant to accommodate indigenous versions of the past in research publications and official documents. Although indigenes verbally voiced their opinions during the public debates at the *Miscast Exhibit* and various national and international conferences since 1996, academic contributions and outlooks have typically dominated the accompanying publications. It is also significant in this regard that the formulation of the New Heritage Bill had heavy archaeological input but little or no contribution from indigenous minorities. In this sense it can be argued that archaeologists have been privileged, as legislation to protect archaeological sites and artefacts has been written more or less for our benefit and to our specifications. Archaeological artefacts may, for instance, be accessed for academic research by *bona fide* researchers. However, it is questionable if indigenous groups would have similar accessibility to what they may regard as their intellectual and cultural property. Material items of the past are effectively the property of the state and under governmental bureaucratic systems of protection, as in museums. The philosophy underlying this legislation is that archaeological artefacts and other items of cultural heritage belongs to the nation and not to individuals or specific ethnic groups. Effectively this would mean that such items could be appropriated as symbols of national identity by the modern nation state - sometimes without the consent of the indigenous minorities concerned. The inclusion of Drakensberg San rock art in the South African coat of arms and the logo of the South African Olympic team would be good examples in point. To the best of my knowledge this process took place without consulting relevant southern San interest groups yet it had significant archaeological input.

The reasons for this apparent lack of consultation with indigenous minorities are multifaceted. Archaeologists, like everyone else, are suspicious of groups or organizations who after more than a century of silence suddenly raise to the surface to claim indigenous and/or 'First People' status. Although some of these groups do have demonstrable historical links with known Khoisan groups of the historical period others are less clearly defined. Given the present political landscape of South Africa political and economic opportunism should not be ruled out as the soul motivating factors for many of these claims. However, archaeologists are also partially to blame for perpetuating versions of the past, which advocate the complete extinction of some groups. In fact, the assumed extinction of the southern San has most probably been the reason for not consulting these First People of southern Africa on the incorporation of San rock art as national symbols in the post-apartheid South Africa. Yet, the southern San is very much alive and some still regard rock art as having spiritual and psychological value (Prins 2000, 2001). As Trigger wrote "what we believe about historical groups helps to shape our opinions of their descendants" (1989:11). For instance, the image conjured up of the San in popular archaeological imagination is one of genetically and culturally distinct hunter-gatherers who lived in particular ecological nodes. Yet this image will not apply to the majority of San people today who have not only undergone major socio-economic change but may also have been altered genetically. Clearly notions of ethnic identity drawn from archaeological stereotyping may not always be adequate to understand and define the dynamics of contemporary ethnic groups and it may be more productive to use anthropological and sociological insights.

That the international movement in recognizing indigenous claims to intellectual property, including cultural heritage, has also caught on in southern Africa is beyond doubt. The Work Group for Indigenous Minorities (WIMSA) and it's satellite body in South Africa the South African San Institute (SASI), for instance, is in the process of formulating a San rock art claim. Here it is interesting that various San groups (those with historical links to the rock art and others) clearly regard San rock art as an important collective expression of San cultural heritage. The exact form, which such a claim may take, and the various implications are still unclear. But it is certain that archaeologists will have to engage in a more productive and intimate manner with indigenous minority groups and forsake the "we know best or lets ignore them," attitude which has been so prevalent in the past. The recent engagement between Khoisan groups and some archaeologists at the *Human Remains in Museums* seminar at Kimberley (September 2001) is a step in the right direction and will hopefully clear the path for future collaboration.

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Previously *Southern African Field Archaeology* was published twice a year - two issues per volume. To save time and money it was decided to combine the two issues into one volume, which will be publish once a year.

Alex Schoeman, co-editor for the past 3 years returned to the University of the Witwatersrand. The Editors would like to thank her for her commitment to the journal and wish her the best in her new position.

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SURFACE AND SUBSURFACE RECONNAISSANCE AT NDONDONDWANE: PRELIMINARY RESULTS OF THE 1995-97 FIELD SEASONS

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ABSTRACT

In 1995, large-scale excavation and surface reconnaissance activities were conducted at the Early Iron Age (EIA) type-site of Ndondondwane, in the Thukela River valley of KwaZulu-Natal (South Africa) in order to increase our understanding of the intra-settlement economic and social organization of EIA communities in southern Africa. By the conclusion of the 1995 season, there was evidence that the site was divided into a central and a peripheral activity zones. The central zone comprises three activity areas: a livestock enclosure, a large hut floor, and an area reserved for specialized activities associated with iron smelting, ivory working, and various rituals. The peripheral zone included a series of domestic and other specialized activity areas (such as a charcoal and raw ore preparation area). The goal of the 1996 season was to further investigate these activity areas and the intervening space between the activity areas. Several techniques of surface and subsurface reconnaissance were employed to investigate spatial patterning at Ndondondwane. The results of the multiple systems of site exploration indicate that any single technique would have been insufficient to efficiently delineate the spatial patterns at the site.

INTRODUCTION

Most approaches to the surface and subsurface reconnaissance of stratigraphically complex sites usually employ either a single method of analysis (*e.g.* surface recovery of remains, geophysical survey, augering, etc.) or do not integrate the results of the various methods. The result is usually a one-sided picture of an otherwise complex three-dimensional situation. Each of the reconnaissance methods yields a different, but complementary picture of the subsurface condition. When several different analytical methods are employed on the same site, the combined result yields a more comprehensive picture of the subsurface condition. This is especially true on large and stratigraphically complex sites where there may be both vertically superimposed and laterally displaced deposits and periods of occupation. On such sites, the distribution of remains on the surface may not

be a direct reflection of subsurface distributions. A variety of processes may alter the relationship between surface and subsurface distributions.

It has become commonplace for archaeologists throughout much of the world to use at least one reconnaissance method on their sites prior to or instead of excavation. The most commonly employed method is that of surface collection (Redman & Watson, 1970 Mueller, 1975b; Flannery, 1976; Cherry *et al.*, 1978; Whallon, 1979), since it can be accomplished by the archaeologists themselves. Less commonly employed are the various geophysical (Clark, 1996) and augering methods (Stein, 1986). When the latter two techniques are employed, their results are usually not fully integrated into the final analysis.

Throughout much of the world, however, most archaeologists continue to ignore the benefits of systematically employing a battery of pre-excavation reconaissance strategies. It is only through a combination of different techniques that the size and nature of complex and overlapping temporally-differentiated occupations in sites can be defined and the most potential areas of excavation be identified. As will be shown here, the use of such pre-excavation methodological frameworks are crucial to the efficient and successful execution of excavation strategies and recovery of targeted data sets.

The data from the site of Ndondondwane will be used to demonstrate the importance of using a battery rather than a single method of surface reconnaissance prior to excavation. This is the first time that a variety of methods have been systematically applied to a small, open-air, stratigraphically complex later prehistoric site in southern Africa. In this region, a battery of systematic pre-excavation reconnaissance techniques are rarely used and almost never to guide excavation strategies. Most investigations have usually been limited to a single pre-excavation survey method, the results of which are most commonly found in separate chapters or appendices of reports and are rarely compared to the results of other analyses (*e.g.* Whitelaw 1994; Van Schalkwyk & Rawlinson 1995).

PREVIOUS RESEARCH AT NDONDONDWANE

The site

Food producing societies spread to the eastern regions of southern Africa at the beginning of the Early Iron Age (c. AD 300-1100). During the almost 1500 years of the Iron Age (AD 300-1800), the internal economic and social organization of early food-producing communities underwent profound changes. However, these are still inadequately understood. Two dichotomous models have been hypothesized to describe and explain the nature of intra-community social and economic organization - the Central Cattle Pattern (Community Level of Organization of Production) and Domestic (or Household) Mode of Production (Hall 1987; Huffman 1990, 1993). The former postulates stability of intra-community organization from the Early to the Late Iron Age, while the latter postulates a rapid social and economic evolutionary transformation between the two time periods.

In order to investigate these two models, *Amafa aKwaZulu-Natali* (formerly the KwaZulu Monuments Council) and The University of Manitoba (Winnipeg, Canada) embarked in 1995 on a multi-year collaborative research program. One of the objectives of this research program is to test these two models through a three-year program of excavation and analysis of an Early Iron Age site in the region.

The site of Ndondondwane was chosen because previous excavations of the site (Maggs 1984; Loubser 1993, 1998) had revealed the well-preserved remains of a small, single-phase, short-term EIA settlement, with architectural and artifactual remains, including fauna and flora. It is the type-site for the Ndondondwane phase of the KwaZulu-Natal Early Iron Age sequence (c. AD 650-750, radiocarbon dates - Maggs 1984). Ndondondwane is located in the lower Thukela river basin, KwaZulu-Natal, South Africa (Fig. 1). This is an area intensively settled by EIA mixed-farming communities (Van Schalkwyk 1992, 1996). Analysis of the earlier data from the site indicated that Ndondondwane had the potential for the kind of large-scale horizontal excavation to specifically test spatial models of intra-community organization.

Ndondondwane was initially identified and test excavations were conducted in 1978 (Maggs 1984). The results of the excavations were used as an essential part of the construction of a regional culture history. Further excavations were conducted during 1982-83 (Loubser 1993, 1998). By the conclusion of the 1995 season, there was sufficient evidence to recognize a series of spatially-discrete activity areas across the site. These were grouped into two major zones: a central and a peripheral zone. The central zone comprises three activity areas, arranged in a line from north to south: a cattle byre, a large hut floor, and an area reserved for specialized activities associated with iron smelting, ivory working, and various rituals (Maggs 1984; Loubser 1993; Greenfield *et al.* 1997; van Schalkwyk *et al.* 1997; Greenfield 1998). Each of these major activity areas was within 40 m of each other. The peripheral zone is distributed in an arc around the central zone and separated from it by a large open space.

The two zones are separated by a distance of approximately 100 m. The peripheral zone can be divided into a series of domestic and other specialized activity areas. The three domestic activity areas (Middens 1-3) were located to the north and east of the central zone. The fourth peripheral activity area, a specialized charcoal and raw ore preparation area, was found in the southern end of the arc (Fig. 2).

The stratigraphy and distribution of remains at Ndondondwane are symptomatic of many Early Iron Age sites in southeastern Africa. Typically, such sites have little vertical superposition of cultural stratigraphy because of

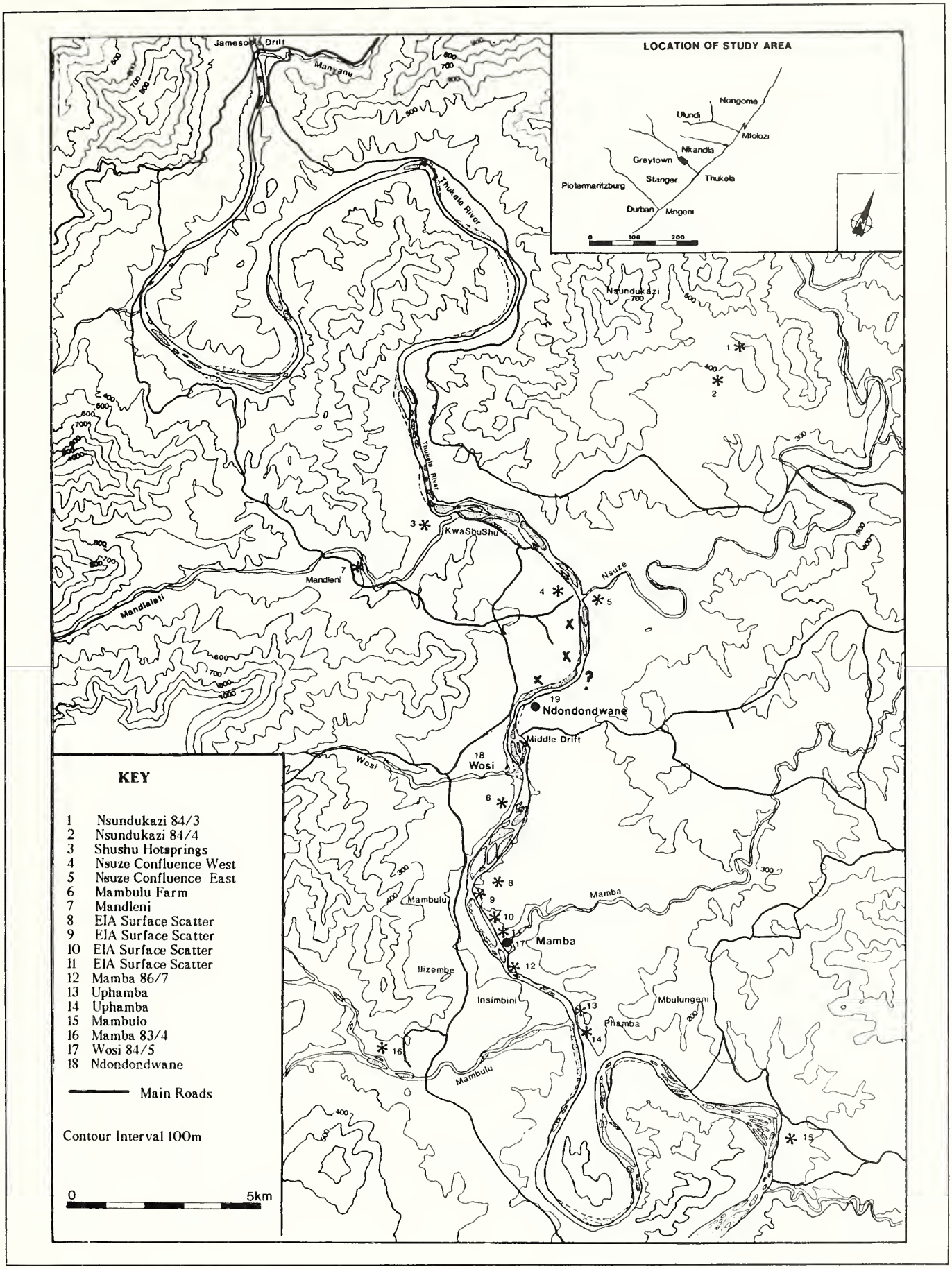

Fig. 1 Map of region (Lower Thukela Valley) and inset (Natal coast).

the nature and/or duration of occupation. Stratigraphy is usually laterally displaced rather than vertically superimposed, whether in single or multiple occupation sites. Very few sites have extensive vertical superposition of temporally differentiated deposits. Most such cases are confined to discrete intra-site midden deposits (Wosi, Ndondondwane; and Umsuluzi – Maggs 1980; Maggs & Ward 1984; Van Schalkwyk 1992; Whitelaw 1993). These result in a complex feature and artifact distribution that should be discerned and traced prior to excavation. The most appropriate manner in which to achieve this goal is through pre-excavation reconnaissance. The site at Ndondondwane was of a sufficiently large scale to require consideration of surface and subsurface reconnaissance. In our estimation, the battery of techniques described below when applied in a systematic and integrated fashion allowed us to tease apart discrete activity areas and other cultural foci prior to extending previous excavations (conducted by us and others - Maggs 1984a; Loubser 1993; van Schalkwyk *et al.* 1997; Greenfield *et al.* 1997). As Loubser (1998) has commented, it is essential to build upon the results of previous excavation initiatives. This is the first time that such an integrated battery of pre-excavation reconnaissance methods has been systematically applied to an Early Iron Age site in the southern African subcontinent. It has been used profitably elsewhere (Clark 1996; Greenfield 2000; McManamon 1984)

Goals of the reconnaissance activities

The goal of the 1996-97 reconnaissance activities at Ndondondwane was to collect information to test the validity of the perceived patterning in the data that was collected during the 1995 and earlier field seasons (1978, 1982-3). Several lacunae in the data were realized at the conclusion of the 1995 season (Greenfield *et al.* 1997; Van Schalkwyk *et al.* 1997). These were the following:

1. Extent of the site – to confirm the extent of the site and individual activity areas within the respective zones. There was an implicit assumption from Loubser's map of the site (1982) that the site was entirely encompassed within the fence surrounding the area.

2. Central Zone - There was the implicit assumption based upon the data from the previous excavations (1978, 1982-3, 1995) that the intervening space between the various central zone activity areas (Mound and Dung Areas) was devoid of features. The finding of the large hut floor in Transect 1 during the 1995 season cautioned us to not assume that the intervening space was empty. We thus had to embark upon a systematic examination of the intervening spaces in order to see if other features were present.

3. Peripheral Zone - A third gap was the definition of the extent and nature of each of the activity areas in the peripheral zone. In our initial report of the 1995 field season, we assumed that the middens in the peripheral zone (Middens 1-3) were domestic activity areas, and their extent was poorly defined. The first step to test the proposition that they could be identified as domestic activity areas required definition of their extent. It was hoped that evidence for hut floors or domestic structures, granaries and other storage facilities, and other activities could be identified through survey. This necessitated expanding our research around each of the domestic activity areas to ensure that the entire spatial locus was sampled.

   Space between the central and peripheral zones - onc of the major gaps included our lack of understanding of the contents and meaning of the space between the central and peripheral zones

4. The apparent low density of surface remains between these zones suggested that the space was potentially devoid of features. To test this, we had to embark upon a systematic examination of this space in order to define its nature and function.

Prior to embarking upon more extensive excavations, it was decided to utilize a multiple reconnaissance technique approach. A variety of surface and subsurface reconnaissance methods were used to collect data to test the above hypotheses. The methodologies and results are discussed below.

Reconnaissance Methodology

A variety of complementary survey techniques for the investigation of surface and subsurface distribution of features and artifact concentrations were applied during the field work at Ndondondwane - topographic survey, systematic surface collection, electrical conductivity survey, and soil auguring (Greenfield 2000). The selection and application of a battery of techniques was inherently dependant upon the results of the earlier seasons of excavations. They were used to test for and determine in a systematic fashion the boundaries of the site; the size, depth, and nature of cultural deposits; and the possible location of features and activity areas within the site. Their results enhanced our ability to eventually target excavation activities to areas with the highest potential for recovering cultural remains.

The application of each technique was designed to provide a hierarchy of feedback information while in the field, so that potentially interesting areas or spatial `hot spots' could be immediately or subsequently examined with other techniques. For example, the topographic survey was the first completed and implied that the west edge of the site should be coterminous with the river-

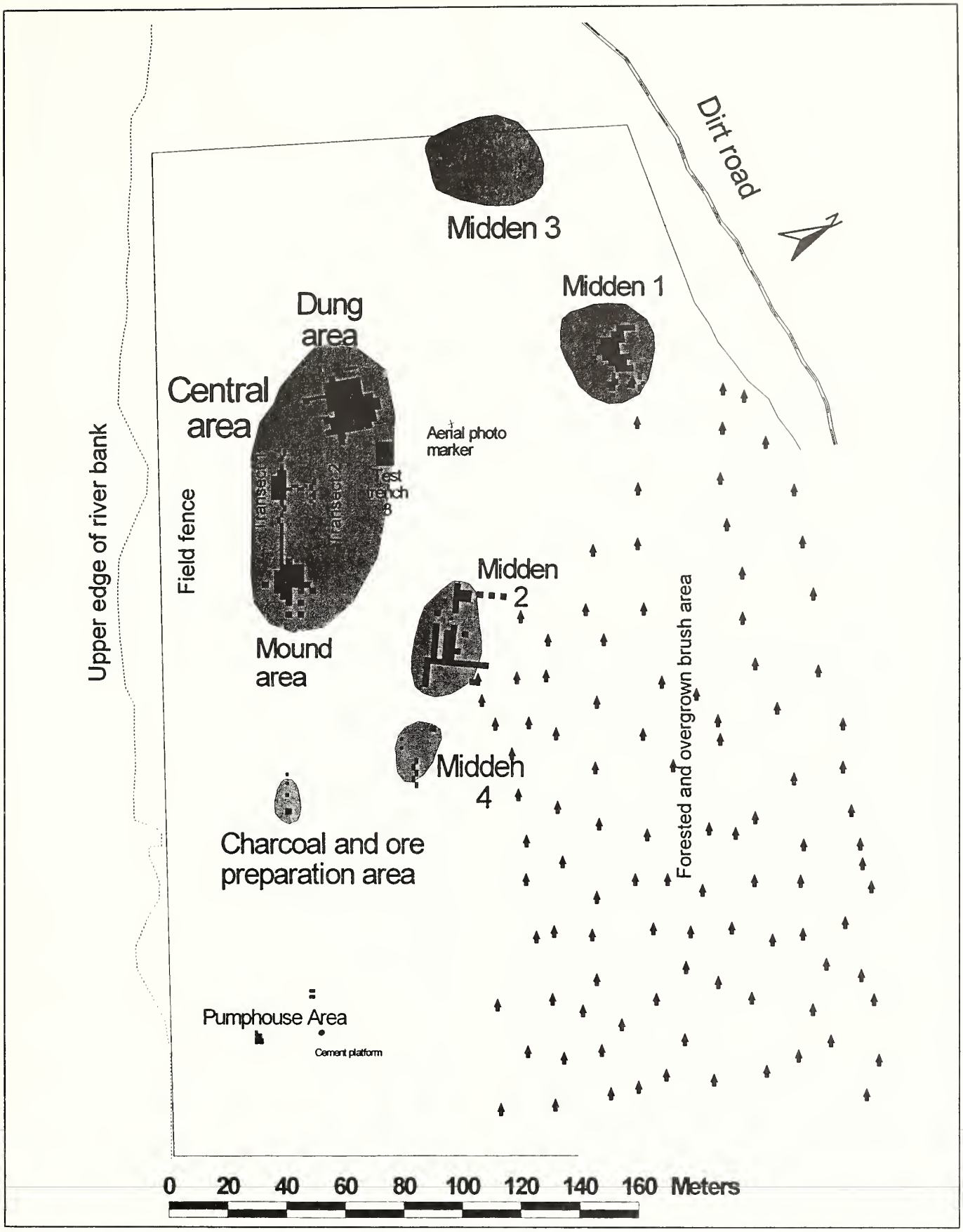

Fig. 2. Map of site (reflecting the areas investigated prior to and during the 1996 field season

bank. This hypothesis was tested by auguring, which showed sterile soils immediately beneath the plow zone, and surface collection which produced only a low volume (<less than pan-site noise) of highly eroded fragments of ceramic in this area (probably the result of down-slope wash). Conductivity anomalies were test with the auger to determine if the anomalies represented *daga* structures, artifact concentrations or deeper pits.

The latter were easily recognizable since they extended into the sterile soil horizons. Surface concentrations of artifacts above subsurface conductivity anomalies were found to be prime correlates for preserved subsurface deposits.As a result, excavation was targeted towards area with high potential for uncovering *in situ* deposits. The results of each of the techniques are discussed below.

Topographic survey

A topographic survey is the initial requirement for conducting any survey activities. It lays out the grid upon which all other activities are founded. The rise and fall of the terrain are mapped at various intervals. As noted previously (Van Schalkwyk *et al.* 1997), the earlier published map (Maggs 1984; Loubser 1993) was inadequate for our research goals. They were limited largely to the 1982-3 ploughed field areas. Our research quickly revealed that the site was infact more extensive than previously thought (to the N and E), but smaller in extent along the southern axis. As a result, we began a new topographic survey. The map in our 1995 field season simply show the distribution of features (excavated areas, activity areas, scrapes, *etc.*) (Van Schalkwyk *et al.* 1997, fig 2).

Surface collection

As noted previously, Loubser's (1993) map also did not contain sufficient quantitative surface distribution data to quantitatively map the distribution of remains across the site. As a result, a systematic surface collection across the site was embarked upon in order to identify surface concentrations. However, parts of the site were covered by dense thicket. These areas of the site had not been fully surveyed by previous investigators due to the impenetrability of the vegetation cover. As a result, two types of surface collections were made at the site - scrapes and ploughs.

In those areas of the site covered by a dense thicket (*Acacia* spp. and *Dichrostachys cinerea*), a Galion Road Grader was used to clear the surface. This area was mostly in the upslope areas of the site. These areas were last ploughed in the 1950's (Campbell Willmore, pers comm.) and had since become thicketed. After bush-clearing, the machine's blade scraped the top 10 cm of sediment to the side forming a win row. The win row was generally 2 m wide. Each win row was divided into 5 m long strips and all material found on the surface of the win row was collected. This system was used in Scrapes 1-3, and 5 (Van Schalkwyk *et al.* 1997).

The second type of surface collection was based upon ploughing or tining of areas. The plough would disturb remains up to a depth of 30 cm (Scrape 6, and all 1996-97 surface collected areas), while the tines from the large graders would reach up to 40 cm from the surface (Scrape 4). In these areas, a systematic intensive surface sampling strategy was employed because of the unknown nature of the distribution of remains the difficulty in estimating site limits, and the desire to collect a spatially-representative sample (Redman & Watson 1970; Redman 1974, 1975; Flannery 1976). To ensure spatial coverage across the site, the sample was stratified by transects. The transects were a by-product of the conductivity survey (described below). Transects were evenly spaced across the site and were 2 m wide. Each was subdivided into 5 m long units. Every other transect was surface collected across each area. All artifacts with the 2x5 m area were collected in a single bag. This was a form of 'cluster' sampling (where spatial units [not individual artifacts] are sampled within a universe of potential units - Mueller 1975a; Vescelius 1960). This maximum length of surface collection units chosen based on our experience during the 1995 season. It was designed to ensure that small potential activity areas were not skipped over and missed. The scheme employed ensured adequate coverage of the surface of the site. It also ensured relatively comparability between collection units from the 1995 scrapes (also 2x5 m).

All remains were identified to a class of material (ceramic, bone, daga, etc.), and counted and volumized (using water displacement). Maps of the distributions were produced with the use of SURFER (r), a contour drawing program. Areas with high densities of artifact distributions were hypothesized to be loci for possible subsurface concentrations. They potentially represented features and middens associated with the occupation of the site. Low density areas were hypothesized to be potential non-activity areas.

Electrical conductivity survey

The objective of the electrical conductivity survey was to identify potential subsurface features in order to target areas with high probability for excavation. Only one intact burnt clay hut floor has been found in the entire EIA of Natal, and this was at Ndondondwane. As a result of the knowledge of the low probability of finding burnt clay floors or high ceramic concentrations, we decided that a technique that was sensitive to soil changes may yield the best results. Conductivity and resistivity survey instruments have yielded good results where burnt clay concentrations (such as above) are lacking and features are largely of a pit-like nature filled with a low density of artifactual concentrations (*e.g.* semi-subterranean structures - Aitken 1969). Both conditions have been found at contemporary settlements. For example, burnt clay (*daga*) granary floors are common in EIA settlements from the region (Huffman 1990, 1993; Whitelaw 1993; Van Schalkwyk 1994a, b) and semi-subterranean features, such as storage pits with both low and high densities of ceramics and other artifacts have been found in sites throughout the region and at Ndondondwane.

A Geonics EM38 conductivity instrument was used in the survey, with a digital data logger. The advantage of this machine was that it can be used in uneven terrain (since it can be lifted off the ground) and can be nulled to an artificial zero to limit day-to-day variation and other sources of interference. The digital data logger

enabled preliminary maps of each surveyed areas to be rapidly produced at the conclusion of each day of fieldwork. This enabled the goals of subsequent field-work days to be adjusted with respect to any apparent patterning in the data. As a result, the survey was eventually extended into areas that were originally not intended to be surveyed (*e.g.* under existing back dirt), while other areas of the site were not surveyed when it became apparent that they would not be productive (over the deeply buried strata along the western edge of the site - from Transect 1 to the river's edge).

The soil type and subsurface geology of the site was favourable for conductivity survey since the rock formations were generally far enough from the surface not to interfere with the readings and the soil was generally a mixed of sandy to clayey loams. The machine was able to read to a depth of 1.5-2 m beneath the surface. Readings were taken at 1 m intervals across the site. The conductivity machines readings are given in ms/m (millisiemens/metre). High ms/m indicate high conductivity (low resistance), while low ms/m indicate low conductivity (high resistance).

The site was divided into 2 m wide transects. Readings were taken at 1 m intervals along each transect. Control point readings were taken every 40 m from a point outside of the area being surveyed and not on top of know features in order to allow for corrections in the intensity of the earth's magnetic field during a transect's survey. This yielded residual readings for each coordinate, which were then used in the construction of the maps. SURFER ® was used to produce contour maps of the residuals to identify areas with significant anomalies.

Parts of the site had been excavated and the trenches left open through the two decades of research. Each of the excavated areas to be conductivity surveyed was backfilled prior to the conductivity survey (Mound Area, Midden 1 and 2, Charcoal Preparation Area). The basal features were often left intact in order to determine if the conductivity instrument could measure their presence (*e.g.* Midden 1, Charcoal Preparation Area).

Soil augering methodology

Soil auguring is an easy way of testing the depth and nature of subsurface deposits without large-scale excavation (Stein 1986). It can recover soil sequences and associated artifacts, allowing a cultural stratigraphic sequence to be constructed. A ten cm wide-mouth, hand-turned soil recovery auger was used. Each type of soil was identified and traced across the site. In general, it was found that the distribution of features was so widely spaced and so small that the site would have to be Swiss-cheesed in order to find all of the features with this method. It was largely used to test surface artifact concentrations and conductivity anomalies. The mouth of the auger was wide enough to enable ceramics, stone, and soil to be recovered in their stratigraphic position. The distribution of different artifact categories was then plotted in relationship to the different soil horizons to map out the extent of the area of occupation.

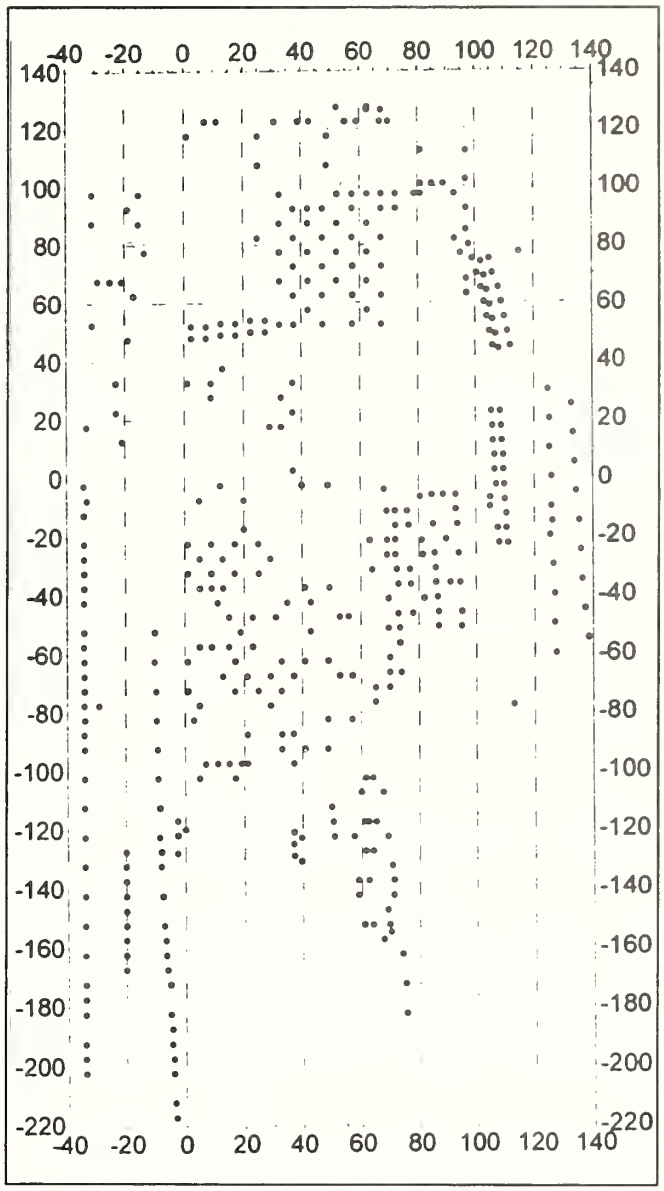

Fig. 3. Map of the distribution of surface collection units from the 1995-1996 seasons.

Reconnaissance Results

Topographic Survey

The topographic survey indicated that the site was not flat at all. This confirmed Loubser's 1982-3 survey of the site (1993). The western half of the site slightly rose from west to east (from 40 m W, along the river's edge, to +40 m E). Beyond this point, the terrain rose at a more rapid rate and the effects of soil erosion were greater. The consequence was that erosion was taking place to the east of this line, and soil deposition was occurring to the west. As a result, the soil horizon above and protecting the cultural deposits in the areas to the east of +40 m were very thin and disturbed by ploughing. The soil horizons above and protecting the cultural deposits in the areas to the west of +40 m were

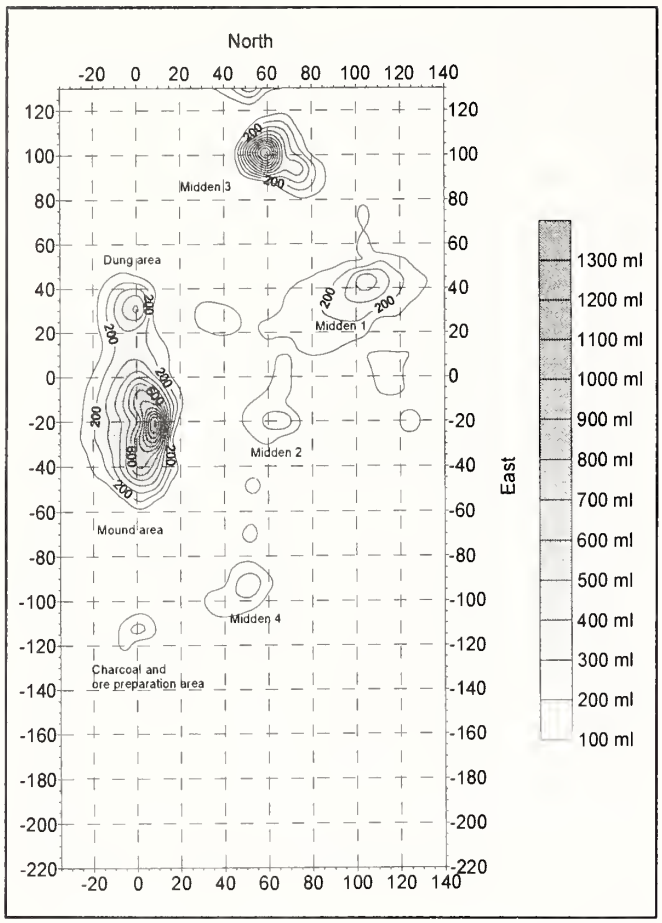

Fig. 4. Map of surface ceramic distributions from 1995-96. The results of the 1995-96 seasons were combined for the purposes of this map. Intervals are in millilitres of displaced liquid volume; 100 ml is the interval used in this analysis.

thicker, thereby more effectively protecting the cultural deposits from plough and other disturbances.

Surface Collection Results

The results from over 200 surface collection units were analyzed using SURFER ® (Fig. 3). The combined results from the 1995-96 surface collection proved fruitful in establishing the dimensions of activity areas previously identified around the periphery of the site (Charcoal Preparation area, domestic Middens 1-3). In addition, it showed that a scatter of debris continued from Midden 2 for a substantial distance to the south (almost 100 m) (Fig. 4). This scatter culminated in another previously unidentified concentration of surface materials that was tentatively identified as the Midden 4. Even though a mask fragment was found on the surface of the area, it is unlikely that it derived from this area. The fragment was possibly dropped by a visitor who picked it up off the surface in the proximity of the Mound Area. The pathway through the site goes along the east edge of Midden 4. Subsequent test excavation of this area, however, proved that the surface concentration extended only into upper plough zone (top 10 cm of soil) and that it was a deflated deposit. The density of material was extremely low indicating that this would a more ephemeral activity area than the other middens in the peripheral zone. It is postulated that this was another domestic midden, but the remains are too scant and scattered to positively determine its nature.

The surface material showed that the activity areas in the center zone of the site really formed a single large area that extended from the north edge of the Dung Area to the south edge of the Mound Area. The burnt hut in Transect 1 and the eroded hut in Transect 2 (see below) did not stand out as easily distinguishable concentrations of remains. Instead, they were masked by the higher concentrations of debris from the two activity areas to their north (Dung) and south (Mound).

Most of the area between the central and peripheral zones had a significantly lower density of debris. Tongues of debris scatter, however, extend down hill (to the west) from Midden 1. The reason that the tongue exists only in this area can be ascribed to two possibilities: 1) Midden 1 is located on a more steeply sloping terrain than any of the other peripheral deposits; or 2) the down hill tongue (from the excavated area) represents the discard location and that the excavated area represents the area of occupation. We ascribe the tongue in this area to be a function of slope movement since the tongue does not pass the contour line common to Middens 2 and 3 (where the slope flattens).

Conductivity Results

A number of anomalies are visible in the map of electromagnetic conductivity values (Fig. 5). Only positive values are used since they best reflect the presence of subsurface cultural deposits on the site.

In the center of the site, the conductivity was able to confirm the presence and extent of the two large excavation areas from previous seasons of research at the site. Each of these areas had very thick (>1 m) and extensive deposits, with high artifact and feature concentrations:

1. The Dung Area, an area with thick dung deposits; and,
2. The Mound Area, an area with thick cultural deposits, but partially excavated already. It is visible by a cluster of low positive residuals (<10 ms/m).

In between these two areas, a large but lower level anomaly was identified by the conductivity survey – this was the concentration of *daga* remains and artifacts in Transect 2. It was not a deeply buried deposit, but was found largely within 1 m of the surface.

Around the periphery of the site, the presence and extent of three of the domestic middens and special activity areas already known through excavation and survey were confirmed as low-level positive anomalies. Each of these areas has deposits close to the surface and dense concentrations of artifacts. These were:

1. Midden 2 (a domestic midden to the east);
2. Midden 3 (a domestic midden to the north); and
3. Charcoal and ore preparation area.

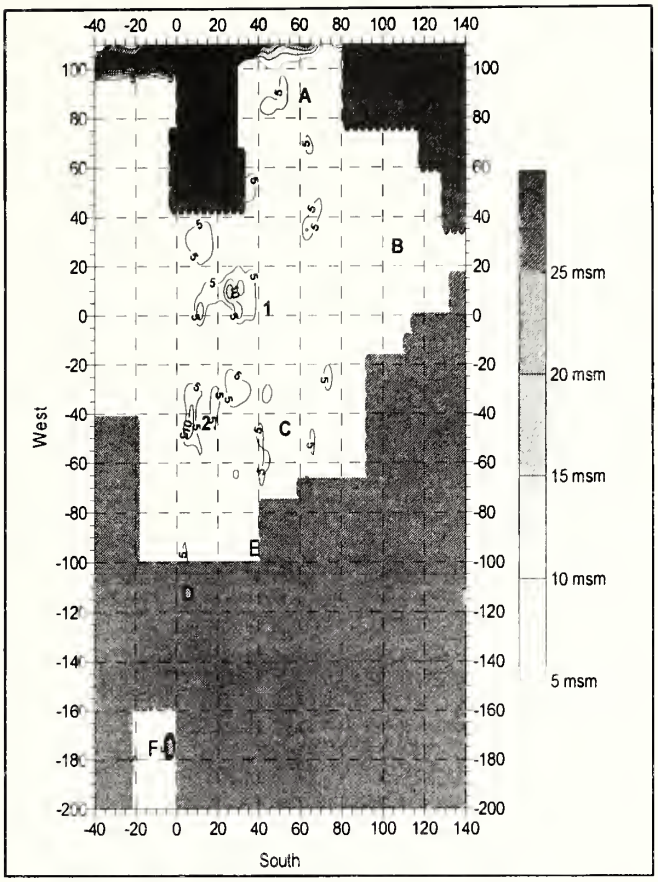

Fig. 5. Map of distribution of electromagnetic conductivity anomalies. Only the positive values of the residuals are employed in this analysis. Areas not surveyed are blanked out. 1 = Dung Area; 2 = Mound Area; A = Midden 3 Area; B = Midden 1 Area; C = Midden 2 Area; D= Charcoal Preparation Area; E = Midden 4 Area; and F = Modern Pump House Area.

A number of areas with known feature concentrations, however, were not identified by the conductivity survey. These include:

1. The burnt hut in Transect 1 (deeply buried beneath 1.5 m of deposit); and
2. The domestic area in Midden 1 (a fully excavated out area with storage pits cut into the subterranean rock).

The reasons that these features did not show up on the conductivity maps are specific to each area. The burnt hut in Transect 1 was too deep (>1.5 m). The subsurface rock basement came too close to the surface masking the presence of the subterranean features in Midden 1 (this area had to be entirely deleted from the analysis).

Conductivity analysis of the soil often yields ambiguous results. On its own, it is usually difficult to determine the nature of an anomaly. It is best used in conjunction with other reconnaissance techniques, such as surface collection and coring. The conductivity survey was successful in identifying the presence of some major features (*e.g.* Dung Area), but it missed other major features. It appears to be a poor identifier of:

1. deflated middens, even though there are substantial quantities of artifactual remains (ceramics) close to the surface (*e.g.* Middens 2 and 3); and,
2. deeply buried features (>1.5 m below the surface), even though there were substantial burnt clay floors (*e.g.* the burnt house in Transect 1).

Even though the conductivity survey did not identify all of the anomalies, it was useful in identifying the location and extent of several previously unknown features.

Augering Results

Augering activities were directed at investigating the `open' space between the central and peripheral zones. A series of auger holes were sunk throughout much of this area. Potential subsurface conductivity anomalies and surface concentrations were preferentially investigated following the site grid.

The results were that a pan-site stratigraphy was discernible. It allowed for the first time for the various areas to be temporally linked. Five major horizons were identified (Fig. 6):

1. Plough zone, with an upper (10 cm thick) and lower (15 cm thick) component. The plow zone became thinner as one moved up hill (between Middens 1 and 2);
2. Cultural horizon 1 (CH 1) - this was the latest temporal component of EIA occupation at the site. It linked to the third phase of occupation in the Dung (Upper of the Middle horizon), Transect 2 (Cultural Horizon 1), and Mound (Loubser 1993, fig. 7; pers. comm. 1999) Areas;
3. Cultural horizon 2 (CH 2) - this was the second temporal component of EIA occupation at the site. It linked to the eroded hut in Transect 2, to the second phase of occupation in the Dung (Middle of the Middle and Upper Loose and Compact Dung horizons), Transect 2 (Cultural Horizon 2) and Mound (Loubser 1993, figs 5 & 6; pers. comm. 1999) Areas;
4. Cultural horizon 3 (CH 3) - this was the earliest EIA occupational horizon at the site. It was stratigraphically linked to the burnt hut in Transect 1, the earliest occupation in the Dung (Lower of the Middle and Lower Loose and Compact Dung horizons), Transect 2 (Cultural Horizon 3), and Mound (Loubser 1993, figs 2 & 3; pers. comm. 1999) Areas; and,
5. Sterile base - this was the pre-EIA occupation sedimentary horizon.

It was difficult to stratigraphically connect these

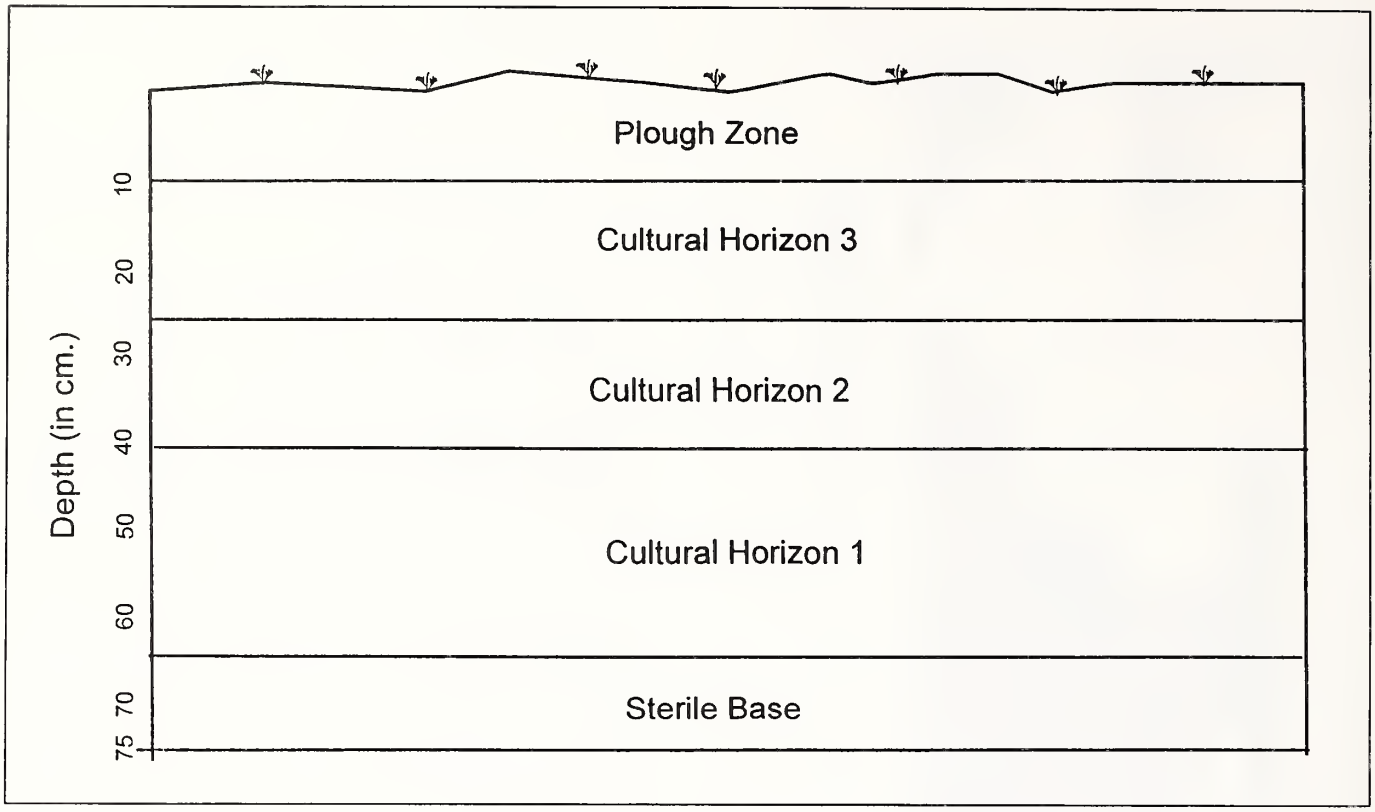

Fig. 6. Schematic profile of pan-site stratigraphy.

cultural horizons with the middens features in the peripheral zone. Deposit deflation and ploughing destroyed much of the direct stratigraphic linkages. For example, Middens 2, 3 and 4 and the Charcoal Preparation area were found entirely in the plough zone. No preserved cultural horizons were found beneath the plough zone in these areas. However, it is possible to reconstruct when each of the peripheral deposits began through analysis of their basal deposits. Each of the peripheral activity areas was located directly above the sterile ElA basal horizon. All of the features in Midden 1 (south hut floor and central slag concentration; and Ash 1), 2 (granary and hut floor), and Charcoal preparation area begin on the sterile base. What is lost in most cases through ploughing, deflation and erosion are the vertically accumulated deposits. Midden 1 deposits were thicker and better preserved than the other peripheral middens. While internal stratigraphy in the Midden 1 could not be discerned, there was internal stratigraphy within each of the features (Ash 1, Pits 1-3). In Ash 1 and Pit 3, there were also three major horizons (Greenfield *et al.* 1997; Van Schalkwyk *et al.* 1997). Coring of the soils across this area indicates that the three horizons phenomenon is not a pan-site occurrence. The top horizon peters out to the east after about 30 m (before reaching the track that crossed the site). Only the two lower horizons (CH 2 and 3) continue to link to the deposits in Midden 2.

Empty Space

The distance between each of the peripheral middens was relatively similar - ca 70 m. This spacing is similar but smaller than the distance of each peripheral midden to the centre of the site, as measured by the one area that remains constant throughout the occupation. The Dung Area was c. average of 100 m from each of the peripheral middens. Surface collection, conductivity survey, and augering did not indicate the presence of any significant loci of cultural activity through the area between each of the peripheral middens. The conductivity survey did indicate the presence of an anomaly along the 80 m east line, to the north of Midden 1. A small test trench (L-shaped) was opened above the anomaly at the mid-point between Middens 1 and 3 (Figure 2). The excavations confirmed the lack of remains beneath the surface. Almost no remains were found on the surface, fewer were found in the plough zone, and none in the underlying matrix. This trench confirmed the hypothesis of "empty" space between domestic complexes. It would appear that middens were highly localised and material was intentionally limited to discard loci near each midden for disposal.

CONCLUSION

Several techniques of surface and subsurface reconnaissance were employed to investigate spatial patterning at Ndondondwane. The results of the multiple systems of site exploration indicate to us that any single technique would have been insufficient to efficiently delineate the spatial patterns at the site.

Analysis of the surface collection data indicated both extent of the site and the presence of several subsurface concentrations. The site is more extensive than previously thought (to the N and E), but smaller in extent

along the southern axis. It is almost 300 m long (north-south) and 200 m wide (east-west). It extends north of the northern fence line, but falls far short of the southern and eastern fence lines.

Several subsurface concentrations were found close to the surface in and around the Mound, Dung, Charcoal Preparation and Midden 1-3 areas. This type of analysis, however, did not identify subsurface concentrations that were too deeply buried to appear on the surface (Transects 1 and 2). The remains in Transect 1 and 2 were too deeply buried for the plow or erosion to bring to the surface. These areas had to be identified through conductivity, augering and subsequent test trenching. The surface collection also indicated the absence of deposits in the 50 m space between the central and peripheral zones. This hypothesis was confirmed through the other reconnaissance techniques.

Augering, on its own, can only be used to obtain an image of the gross stratigraphic relationships across an area. It allowed us to tie together the various deposits across the site into an overall pan-site series of horizons without having to conduct expensive, time-consuming, and labour-intensive excavation. Augering, however, is an inefficient way to find subsurface features over a large area since the site must in essence be swiss-cheesed. For example, we did not immediately recognize the hut floor in the east edge of the Dung area when we augered through its centre. The density of remains was too low to have a high probability of being picked up in the 2 cores and the soil in the cored areas of the hut was not easily differentiated from that around the hut. Only small areas of the floor were burnt enough allow easy visual identification of its function. Augering, however, was extremely helpful in confirming the presence of the activity area in Transect 2. It appeared originally as a conductivity anomaly, but was too deeply buried to appear as a surface concentration. The presence of more than the usual number of cultural horizons in the auger confirmed the existence of something unusual at this location. Excavation then confirmed suspicions based upon the conductivity and augering.

Conductivity analysis of the soil was best used in conjunction with the surface collection and augering. On its own, it is usually difficult to determine the nature of a geophysical anomaly (Greenfield 2000). The conductivity survey was successful in identifying the presence of major features or activity areas, such as the hut at the east edge of the Dung Area and the activity area in Transect 2. It missed, however, minor features such as the fire pit in Midden 1, and gave false readings for the many small anomalies that were tested by coring around the Midden 2. It also did not yield any evidence of anomalies around Midden 1 or 3. It is unlikely that these areas are devoid of any subsurface features, given the concentration of remains on the surface in these areas and the results of excavations on the various peripheral domestic middens. Time and the need to complete other priorities in the research program precluded further investigation of what we suspected would prove to be very ephemeral remains (*e.g.* the hearth and hut floor in Midden 1).

In conclusion, the application of any single technique would have resulted in misleading conclusions concerning the nature and distribution of subsurface remains. The nature and extent of the site and various activity areas at Ndondondwane were efficiently determined through the use of multiple reconnaissance techniques.

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LATE QUATERNARY ARCHAEOLOGICAL AND PALAEO-ENVIRONMENTAL DATA FROM SEDIMENTS AT RHINO CAVE, TSODILO HILLS, BOTSWANA

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ABSTRACT

This paper reports on the 1996 excavations at Rhino Cave. This site is marked by a painting of a white rhinoceros that is bifurcated by a red giraffe. There are also numerous wall depressions or cupules. Approximately 150 cm of deposits were uncovered revealing that the site was used during the time of local Early Iron Age villages as well as during the LSA and MSA. The MSA deposits contain an abundance of lithic materials characterized by unifacial and bifacial points made on corner struck flakes as well as small core scrapers. A detailed palaeoenvironmental study of the stratified deposits was conducted. Sediment analysis clearly demonstrated 3 units (A, B and C) span much of the Holocene and 3 units (D,E and F) are associated with the MSA and the Late Pleistocene. The results of the analysis of the Holocene sediments agrees especially well with data from other localities in the Kalahari.

INTRODUCTION

Archaeological and palaeoenvironmental research was initiated at Rhino Cave in 1995 as part of the Botswana National Museum's long-term interest in the Tsodilo Hills. As a result of this long-term work, Tsodilo has become one of the most significant archaeological areas in the Kalahari; a region that was previously thought to have been 'marginal' in prehistory. The hills contain over 3,500 rock paintings, rock shelters with Later and Middle Stone Age deposits, Early Iron Age villages and numerous prehistoric specularite mines (Denbow & Wilmsen 1986; Robbins *et al.* 1994; Campbell *et al.* 1994, Robbins *et al.* 1998, Robbins *et al.* 2000). The

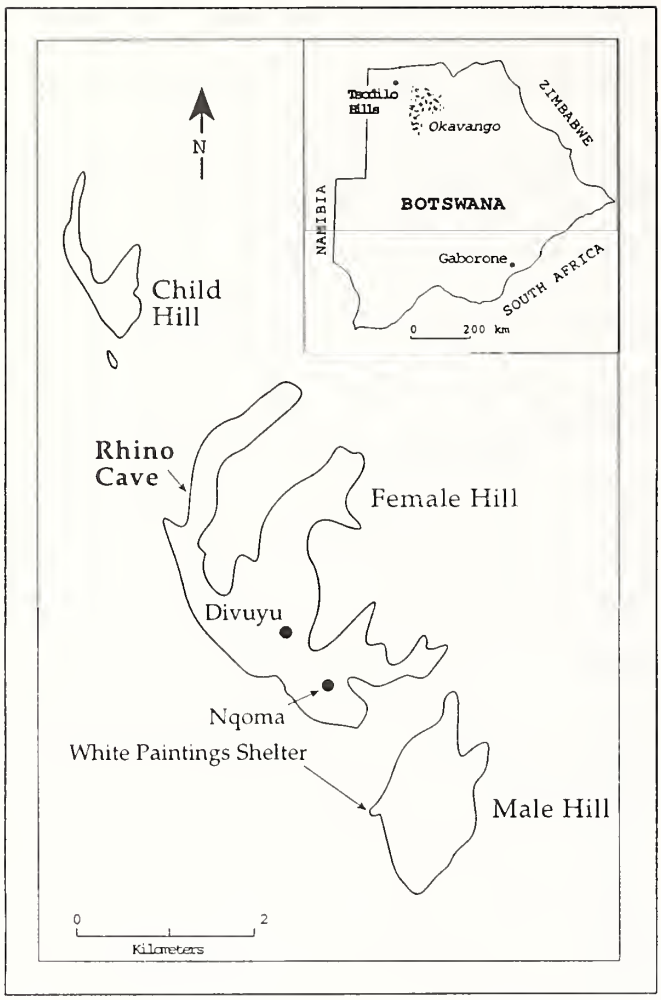

Fig. 1. Map of the Tsodilo Hills showing the locations of Rhino Cave, the Depression and White Paintings Rock Shelter and the villages of Divuyu and Nqoma.

Fig. 2. Painting of rhinoceros and giraffe.

overall archaeological record at Tsodilo covers at least the last 100,000 years (Robbins *et al.* 2000).

Rhino Cave is a small, naturally hidden fissure situated near the north end of Female Hill (Fig. 1). The cave is named after a prominent painting of a rhinoceros on one of the two walls. The rhino is painted in white and is bifurcated by a red giraffe (Fig. 2). There are also several red geometric designs; most notably circles enclosing grids. On the wall of the fissure opposite to the paintings are more than 300 grooves and depressions, or `cupules' that have been intentionally ground into the wall. The depressions and grooves are among the best preserved at Tsodilo and are naturally illuminated by changing pat-terns of afternoon sunlight which shine through a small opening in the boulder choke at the rear of the cave.

Two 1 x 1 m squares were excavated at the site in 1995 adjacent to the painted area of the wall (squares 1 & 2). The upper 50 cm of deposits only contained sparse archa-eological evidence. Denser concentrations of Later Stone Age lithic materials appeared at approximately 55 cm. Middle Stone Age deposits containing small corner-struck (the striking platform and bulb of percussion is on the basal corner of the point) unifacial and bifacial points were uncovered at a depth of 90 cm. These MSA deposits extended to a depth of 130-140 cm. A detailed account of the 1995 findings, including a description of the rock art is presented elsewhere (Robbins et al. 1996a). This paper reports on the follow-up work carried out at Rhino Cave in 1996, emphasizing new findings that either modify, or increase, our original understanding of the site. Particular attention will be paid to the sediment analysis in relation to palaeoenvironmental reconstruction and the implications of this work for regional comparisons in the Kalahari.

In 1996, two additional one meter squares, designated squares 3 and 4, were excavated adjacent to the 1995 excavations (Figs 3 & 4). The excavation of squares 3 and 4 allowed us to extend our cross section of the deposits through most of the width of the cave and recover a large sample of artifacts (Fig. 5). We uncovered 1,50 m of archaeological deposits, excavating most of the area in 5 cm arbitrary levels. As will be shown, most of the artifacts found in the 1996 excavations belong to the Middle Stone Age. However, the upper levels (generally above 35 cm) yielded the first pottery discovered at the site, as well as a low density scatter of lithics, fauna and mongongo (*Ricinodendron rautanenii* Schinz) nut shell fragments (Campbell & Robbins 1990).

STRATIGRAPHY AND DATES

The cross section of the 1995 and 1996 excavations shows a stratigraphy dominated by wedge-shaped units (A to F) that thicken in a northwest direction essentially away from the entrance to the rock shelter (Fig. 5). The upper three units (A-C), consisting of medium to fine sand and silt, are generally brown to grayish brown in color. These overly a much coarser, grayish brown deposit, dominated by angular rock fragments usually less than 6 cm long (very coarse gravel) in a matrix of medium to fine sand (unit D). Many of the rock fragments are imbricated, with their long axes and flat surfaces paralleling the slope of the deposit. Underlying unit D is 15-25 cm of pale brown, medium to fine sand

Fig. 3. View of the 1996 excavation of squares 3 and 4.

(unit E), and beneath this is a brown to yellowish brown, fine gravel (unit F). Unit F is distinctive as it includes rounded 1-1.5 cm diameter gravel, among larger sub-angular to sub-rounded clasts generally less than 10 cm long, all in a matrix of sand. A more detailed description of the sediments and their possible palaeoenvironmental significance will follow a description of the archaeology.

A radiocarbon date of 1660 ± 80 BP (cal. AD 225-590) was obtained from charcoal fragments recovered from a depth of 20-25 cm in unit A of square 3 (Beta 106240). This date is close to the age of the earliest dates for the Tsodilo Early Iron Age village of Divuyu (Denbow & Wilmsen 1986). Together with the date of 980 ± 80 BP (Beta 84719) obtained from square 2 in 1995, this shows that Unit A was probably laid down during the later part of the Holocene. The ages and artifacts in unit A also suggest that Rhino Cave was probably frequented during the time of Divuyu (1400 ± 70 to 1190 ± 70 BP) as well as during the time of the more recent village of Nqoma (1290 ± 60 to 860 ± 60 BP). Most of the cultural material found during this relatively late period of prehistory is sparse, and supports our original conclusion that the cave was only visited briefly on an occasional basis during the Early Iron Age. A date of 5300 ± 160 BP (Beta 84720) from 70-75 cm in square 2, near the base of unit B suggests that this unit is mid- to late-Holocene in age. It should be noted that this date was obtained from a sample recovered in the 1995 work in an area where the Holocene deposits of unit B were comparatively thick and where the LSA artifacts were very numerous (Robbins *et al.* 1996a). So far, we have no dates for unit C which is restricted to square 1. However, we believe that this is an early Holocene deposit.

Units D-F are clearly late Pleistocene in age as evidenced by numerous finds of MSA points in them. Use of Rhino Cave during the MSA appears to have been quite significant judging from the large numbers of artifacts recovered (Table 1). However, dateable charcoal was rare in the deeper deposits and there was no fauna in the MSA levels. An AMS radiocarbon date of 14 500 ± 50 BP (Beta 106241) was obtained on a small charcoal sample recovered from 65-70 cm in unit D, square 3.

In addition to the radiocarbon date of 14 500 ± 50 BP cited above, a thermoluminescence (TL) age of 18 175 ± 2871 BP (corrected to the radiocarbon timescale according to Bard *et al.* 1990, this is 15 448 BP) was obtained on a sample from unit F. While most of the dates from Rhino Cave are consistent with the natural stratigraphy shown in Figure 3, it is emphasized that the two dates from the levels containing MSA tools (14 500 ± 50 BP and 18 175 ± 871 BP) are substantially younger than ages obtained for the MSA at the Tsodilo White Paintings Shelter as well as elsewhere in southern Africa (Robbins *et. al,* 2000, Brooks et al. 1990, Volman 1984). For example, at the White Paintings Shelter a TL age on sediments from the upper part of the MSA at 500 cm was 66.4 ± 6.5 ka (Robbins *et al.* 2000). For this reason, the age of the MSA deposits (D through F) at Rhino Cave should be regarded as uncertain. As the sample for TL dating was taken close to the wall of the shelter, in heterogeneous deposits, and as no field gamma spectrometer measurements were made, estimation of the annual dose at the sampling site is difficult and this may account for the young age that does not correspond with ages from other MSA sites.

The stratigraphy shown in Figure 5 indicates that most of the cultural material and associated sediments accumulated between two very large boulders which served as natural traps for this material (Figs 4 & 5). Because much of square 4 (1996) contained a massive rock, our detailed discussion of the artifacts obtained in 1996 is based almost entirely on the large amount of material recovered from square 3.

ARCHAEOLOGICAL FINDINGS

Nearly 10,000 artifacts were recovered from square 3, most consisting of lithic debitage; largely flakes, broken flakes, and angular debris (Table 1). Only about 3.5% of the lithic material has evidence of retouch and could, therefore, be classified as formal tools (Table 2).

Most of the artifacts were concentrated in the coarse deposits between 45-95 cm with the MSA points clustering in the same approximate depth range (Tables 1 & 2). Because the MSA deposit slopes markedly (about 25°) to the northwest (see Fig 5), MSA points were encountered at shallower depths in the 1966 exca-

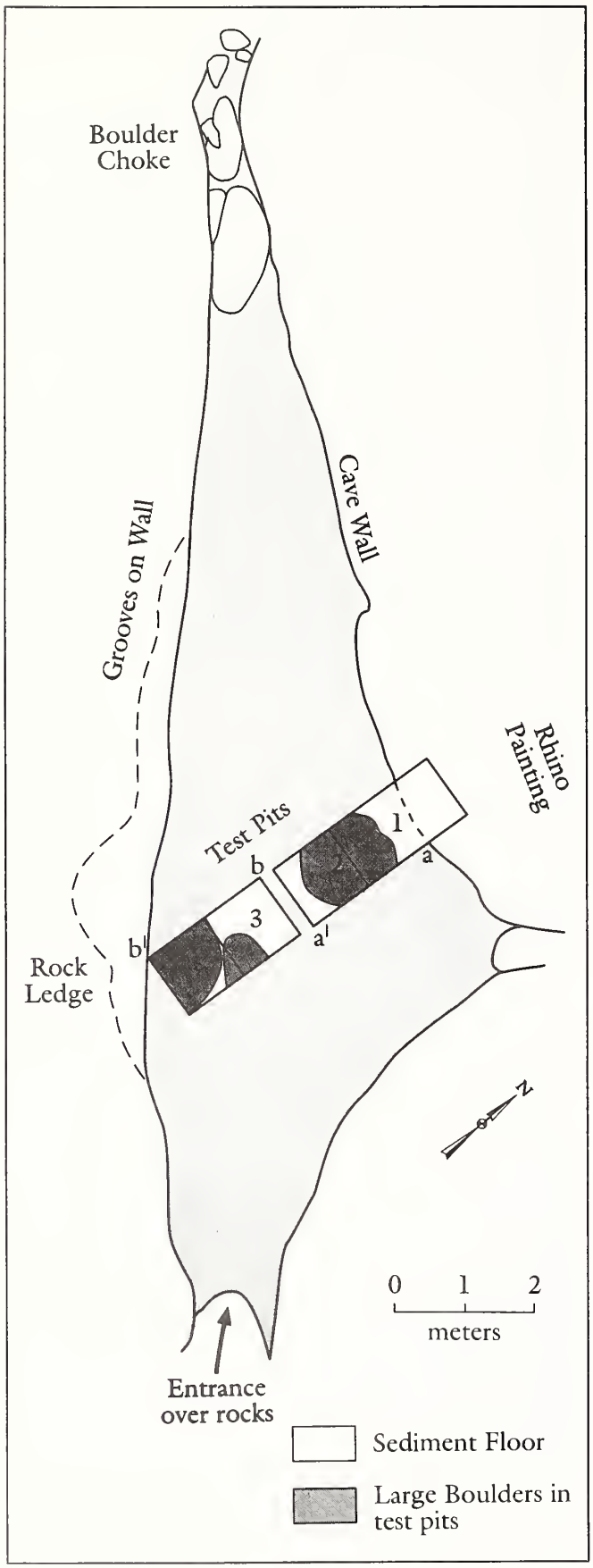

Fig. 4. Map of Rhino Cave showing squares 1-4 excavated in 1995 (1 and 2) and 1996 (3 and 4).

vations than was the case in 1995 (Robbins et al. 1996a). An overview of the 1996 findings follows.

Later Prehistory: Units A and B:

The upper 25 cm consisted of ashy sand with numerous dispersed charcoal fragments. As mentioned previously, a date of 1660 ± 80 BP was obtained from the 20-25 cm level of square 3. As seen in Tables 1 and 2, the fine sediments, as a whole, contained sparse lithic remains, a few potsherds, mongongo nut shell fragments and animal bone fragments. There were no ostrich egg shell fragments or iron artifacts.

The stone artifacts included very few formal retouched tools. There were two small scrapers (jasper and chert) similar to LSA finds from the Tsodilo Depression shelter where such tools are also commonly found in levels that have yielded small amounts of pottery (Robbins 1990). A small quartz crescent, or segment, was recovered from the adjacent square 4 in the 10-20 cm level. The debitage, which was generally quite sparse, mainly includes small quartz flakes along with jasper, silcrete and several varieties of chert. The quartz is locally available, whereas the other raw materials are believed to come from more distant sources.

Most of the faunal remains were concentrated between 25-35 cm. There were 184 bone fragments thought to come from small animals. Both burned and unburned bone fragments were evident. Since the bones, as well as the nut shells, were found amidst the ashy deposits, they are believed to be food refuse. While the bones were generally too fragmentary for identification, the 35-40 cm level yielded a bird bone in the guinea fowl size range and a small piece of tortoise shell was recovered from 10-20 cm in square 3.

A small, undecorated rim sherd was found in the 0-5 cm level. Another sherd from a different vessel was recovered from 20-22 cm close to where the radiocarbon sample that produced the date of 1660 ± 80 BP was obtained. This large sherd is decorated with two rows of fingernail impressions just below the rim. Sherds with nail impressions are reported by Hendrickson (1986) to form 2.0% of the types of decoration found at the Early Iron Age village of Divuyu where there is a large quantity of decorated pottery. Two additional undecorated body sherds with charcoal temper, a regional Early Iron Age characteristic, were recovered from the 25-30 cm level. Elsewhere at Tsodilo, Early Iron Age sherds have been found in deposits with LSA artifacts at the White Paintings and Depression shelters as well as the Lower Male Hill Cave (Robbins 1990; Campbell *et al.* 1994; Robbins *et al.* 2000).

The Middle Stone Age deposits: Units D, E. and F

As noted previously, the underlying coarse deposits of units D and F, as well as unit E, contain unifacially and bifacially flaked MSA points. Seventy one points were recovered including complete points, fragments and some that were probably not completely finished (Fig. 6). Some of them appear to have been broken while being manufactured. While most of the points, especially the complete specimens, are 'typical' MSA

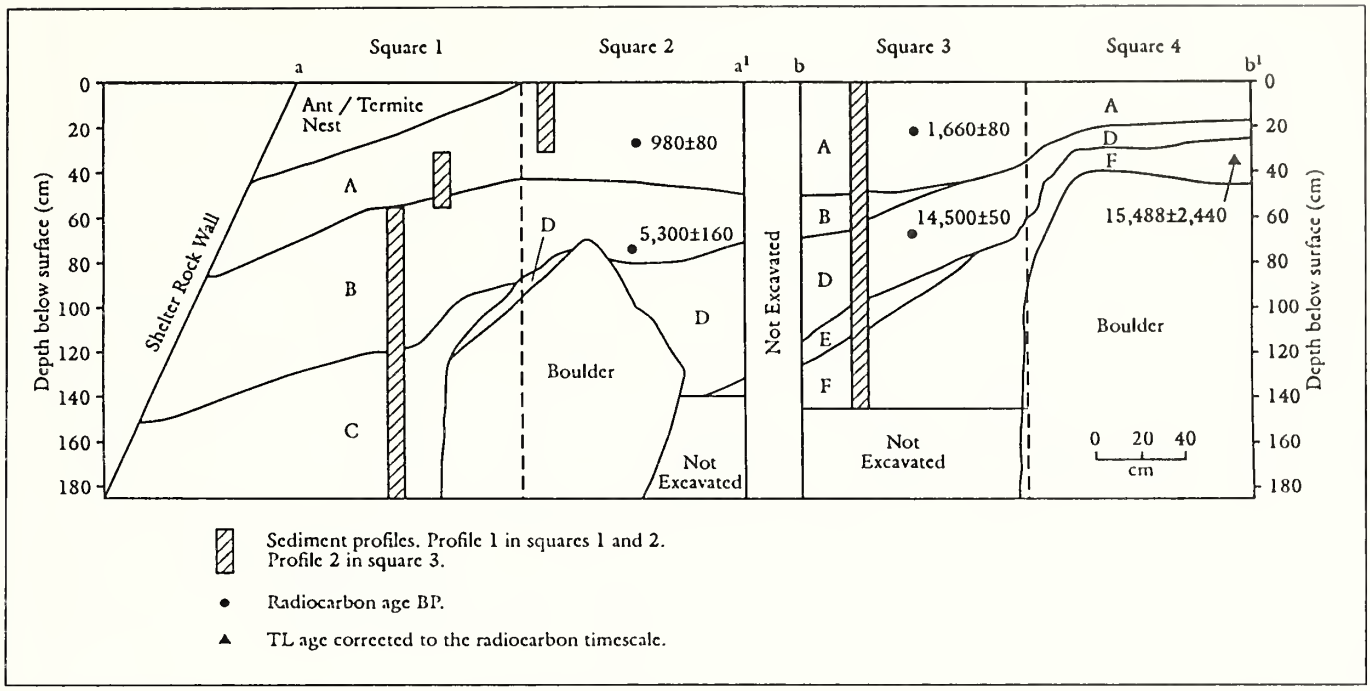

Fig. 5. Stratigraphic cross section of the east wall of squares 1-4 showing sediment profiles 1 and 2 and radiocarbon data.

points, some of the preforms, or point blanks, as well as other specimens that seem to be unfinished, are more difficult to distinguish clearly from other classes of artifacts such as pointed scrapers and awls. The raw materials used in making the Rhino Cave points include quartz, several varieties of chert, jasper, chalcedony and silcrete. The types of chert used by the MSA peoples are distinguished by colour and are detailed in Robbins *et al.* (1996a).

It was possible to classify sixty-seven of the MSA points found in Square 3 into the following groups.

Finished points: 33
Point tips: 12
Point bases: 2
Unretouched point preforms or blanks: 5
Points in manufacture: 8
Failed, or rejected points: 5

The presence of unfinished and broken points along with the large amount of debitage recovered, indicates that the cave served as a location for tool production during the MSA. Non-local raw materials (cherts, jasper, chalcedony and silcrete) were brought to the site to be made into tools. The point tips were either broken in manufacture/ sharpening, or were brought into the cave embedded in the body parts of animals that were going to be butchered further or eaten.

In addition to MSA points, scrapers are well-represented among the retouched tools. We did not find any small scrapers of LSA type in the coarse deposits, though they do occur in the overlying deposits. However, one kind of small core, or steep scraper, was recovered that is quite distinctive. Such tools were typically made in an identical fashion on thick flakes that result from the splitting of a core. Ten of these scrapers were recovered from the 5 cm spits excavated between 70 and 90 cm, within layer D. They may, in fact, be an indicator of a general period within the MSA at the site. The small core, or steep, scrapers included the following raw materials: jasper (2), chert (7) and silcrete (1).

Distally backed bladelets or points were also found in the coarse deposits, clustered between 65-85 cm in Square 3 (Table 2). These finds were first recognized in the 1995 work where they were previously found in both LSA and MSA levels. It could be that these artifacts (given the clustering by depth) are also stratigraphic indicators of change within the MSA, along with the small core/steep scrapers.

It should be noted that the technique of producing bladelets was evident near the base of the deposits in association with the MSA. For example, a well-made single platform bladelet core made on a piece of crystalline quartz was found in square 3, 1,30-1,40 m. This core is identical to specimens found at the base of the Tsodilo Depression site at 5,0 m where the deepest and oldest radiocarbon date of 18 910 ± 180 BP was obtained from the 2,70-2,80 cm level (Robbins 1990). Thus, the Rhino Cave specimen found in an MSA context adds to the information regarding the long antiquity of the microlithic reduction technique in the Kalahari.

A final point is that specularite was found in both the later prehistoric and MSA deposits. The specularite occurs in the form of small metallic crystals and pieces of vein specularite. The latter type of material, including the artifact described below, is often rich enough in iron

Table 1. Artifacts recovered from square3 during the 1996 excavations.

	A.d.	Flk.	Blt.	Bl.	C.	Pb.	Gds.	Hs.	Utl.	Rt.	Sp.	Pot.	F.	Mg.	Mr.	Oth.	Tot.
0-5		2										1	1		1		5
5-10		7															7
10-20	2	8								1			127	1		1	140
20-25	3	10			1							1	37	4			56
25-30	7	25	1	1	2							2	11	7		1	57
30-35	48	68	17	1	3			1		2	2		2	5		1	150
35-40	46	99	11	1	3					3							163
35-40s	13	59	3			1				1			5	8			90
40-45	62	110	16	1	2		2	1		13						1	208
40-45s	2	26	2											2			32
45-50	150	388	30	6	21			1	4	18						1	619
45-50s	5	32	4		1					1				2			45
50-55	208	502	52	3	14		1	1	9	25	4						819
50-55s	7	43	3		1					3			1				58
55-60	189	471	62	7	15				11	44	7					1	807
55-60s	15	52	3	1	1				1	1	1						75
60-65	142	440	30	8	11		1	4	1	23	6						666
65-70	130	478	35	4	13	1	3		12	19							695
70-75	136	372	29	6	6		1	1	12	18	2						583
75-80	145	526	48	10	19		1		19	35	1					2	806
80-85	118	630	48	7	14			2	9	33						6	867
85-90	155	879	50	13	11	1			21	48	4					1	1183
90-95	82	358	28	6	8				13	20	1					1	517
95-100	72	258	13	2	10				10	13	3						381
100-105	73	379	32	3	17		1		11	15	2						533
105-110	35	125	6	2	1		1		3	2							174
110-115	13	100	10			1			3	3	1						131
115-120	7	33	1			1			2								44
120-125	5	4	1	1						1							12
125-130	1	4								1	1						7
130-140	2	3			1												6
140-150	2	5	1		2												10
Total	1875	6496	536	83	177	5	10	12	141	343	35	4	184	29	1	16	9946
Key																	
A.d=Angular debris, Flk=Flake, Blt=Bladelet, Bl=Blade,C=Core, Pb=Pebble																	
Gds=Grindstone, Hs=Hammerstone, Utl=Utilized, Rt=Retouched, Sp=Specularite																	
Pot=Pottery, F=Fauna, Mg=Mongongo nut, Mr=Marula, Oth=Other																	
S= sand area of unit																	

to be attracted by a magnet when the artifact is balanced near the midpoint. The crystals are commonly found at exposures on the upper part of the Male Hill and the vein material is derived from the Tsodilo bedrock. Both forms were being intensively mined between AD 800-1000 at Tsodilo (Robbins *et al.* 1998), but it is clear from the work at Rhino Cave that both types of specularite were being used for a long period prior to the intensive mining. One unique thin slab of the vein material, measuring 7.2 x 7.0 x 1.0 cm was recovered from the MSA deposits of square. 3, 1,0-1,05 m (Fig.7) This piece has a beveled edge that is worn and polished from use, perhaps for rubbing hides. The specimen is flat on both surfaces and the polished edge is convex.

Sediment analysis and paleoenvironmental inferences

Sediment Characteristics

In an attempt to understand more about the sediment sequence in the cave and its relation to artifact discoveries, we have examined samples of sediment recovered in both 1995 and 1996 (Profiles 1 and 2).

Table 2. Retouched tools recovered from square 3 during the 1996 excavations.

	B.pt	B.	Sc.	Awl	Brn.	Den.	R.b	R.b/1	N.	MSA/1	MSA/2	MRP	Brk.	Oth.	Total
0-5 cm															0
5-10															0
10-20			1												1
20-25															0
25-30					1										1
30-35		1										1			2
35-40												2	1		3
35-40/s												1			1
40-45		2		4	1					1		5			13
40-45/s															0
45-50		1		1	4				1	6	1	4			18
45-50/s		1													1
50-55		1	6					1		4	5	4	3	1	25
50-55/s			1	1								1			3
55-60		2	4	2	2	2				13	1	10	7	1	44
55-60/s	1														1
60-65	1		5	2		1			2	7		4		1	23
65-70	1		1	6	2	1				3	1	2	2		19
70-75			5	1	1			2	1	4		4			18
75-80	1	1	6	5		7	2	2	1	4		5	1		35
80-85	1	2	11	2			2	1	1	5	1	4	3		33
85-90			13	6	3	1		1		7		13	4		48
90-95			3	4			1		1		3	7		1	20
95-100		1					1				2	7	2		13
100-105			1			5	2		2	1		1	2	1	15
105-110						1						1			2
110-115										1	1	1			3
115-120															0
120-125				1											1
125-130								1							1
130-150															0
Total	5	12	57	35	14	18	8	8	9	56	15	77	25	5	344

Key

B.pt=Backed point, B=Other backed,Sc=Scraper, Awl=awl

Brn=Burin,Den=Denticulate,R.b=Retouched blade, R.b/1=Retouched bladelet

N=Notch, MSA/1= MSA unifacial point, MSA/2=MSA bifacial point

MRP=Miscel. retouched piece, Brk=Broken tool, Oth=Other

Note, /s indicates sand area, e.g. 50-55/s

Columns of sediment were removed in increments of 5 cm from deposits exposed by the 1995 and 1996 excavations. Sampling extended to 185 cm in squares 1 and 2 and to 145 cm in square 3. Generally, 400-500 g of sediment was collected but in coarser deposits samples of up to about 1300 g were taken for laboratory analysis. For this report ten samples have been studied from squares 1 and 2 and eight from square 3 (Fig. 5). Sediment color was determined on dry, untreated samples using a Munsell color chart. Visible plant and bone fragments, and stone artifacts, were removed before textural analysis began. Material coarser than 0φ was removed from the samples and dry sieved at 0.5φ intervals to -3φ and sieved at 1φ intervals from -3φ to -6φ to determine gravel percentages.

Sub-samples of about 25 g from the >0φ fractions were then treated with 0.5 N hydrochloric acid to remove carbonates (there was very little) and then with hydrogen peroxide to remove any remaining organic matter. What remained of each sample was dispersed in a solution of sodium hexametaphosphate and wet-sieved through a 4φ sieve to remove silt and clay. Particles

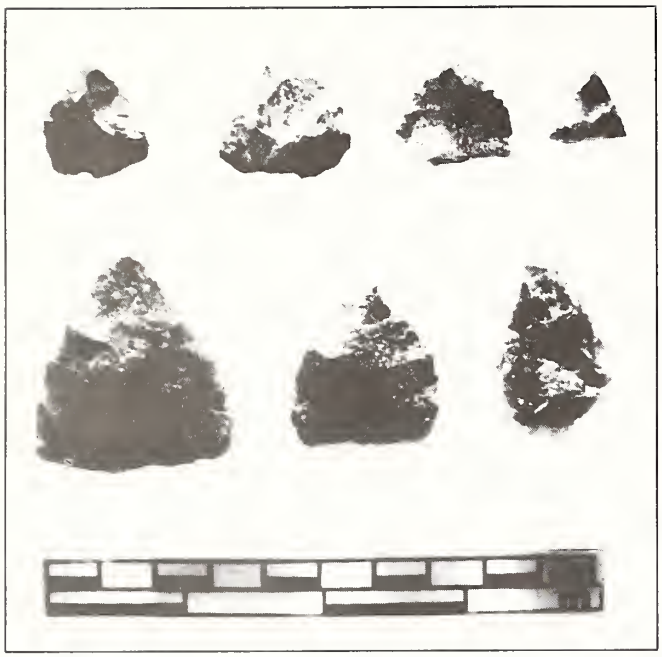

Fig. 6. MSA points from square 3 excavated in 1996. Upper row, left to right: 65-70 cm, 55-60 cm (in manufacture), 50-55 cm (tip). Lower row, left to right: 90-95 cm, 85-90 cm.

Fig. 7. MSA artifact with polished and ground edge from square 3, 1,0-1,05 m.

coarser than 4ϕ but finer than 0ϕ were dry sieved at 0.5ϕ intervals. The silt and clay separated by wet sieving was then subjected to pipette analysis to determine percentages of silt and clay. Mean grain size, sorting, skewness and kurtosis were determined by the graphical method of Folk and Ward (1957).

Clay mineral analysis was conducted on samples from units A (35-30 cm), B (90-85 cm) and C (1,70-1,65 m) in Profile 1, and from units A (25-20 cm), B (65-60 cm), D (85-80 cm), E (1,05-1,0 m) and F (1,25-1,20 m and 1,45-1,40 m) in Profile 2. Samples were prepared via centri-fugation to yield a <2 micron sub-fraction. All samples were oxidized with standard soil procedures to remove organic matter prior to X-ray analysis. X-ray diffraction (XRD) mounts were prepared by air drying a suspension of each clay fraction on a glass slide. Diffraction data were collected on a Scintag XDS-2000 diffractometer over the range 2-30 degrees 2-theta.

Sediment characteristics through Profile 1 for test pits 1 and 2, and through Profile 2 for test pit 3, are shown in Figs. 8-11. In essence, the results reflect the stratigraphic sequence observed in the field and discussed briefly above (Fig. 3). Profile 1 passes through units A, B and C. Mean grain size varies from 1.7 to 2.1ϕ which is in the range of medium to fine sand. The sediments are poorly to very poorly sorted (standard deviation 1.1-2.7ϕ), positive (fine)-skewed to very positive (fine)-skewed (skewness 0.1-0.4ϕ), indicating a fine tail, and leptokurtic to extremely leptokurtic (kurtosis 1.2-3.8ϕ) reflecting relatively peaked particle size distributions (Fig. 9). Average properties of sediments in units A-C are shown in Table 3. The data indicate that unit B is slightly coarser than units A and C, that the sediments are better sorted upwards in the profile, that all units have a fine tail (positively skewed), and that peakedness increases with depth (Table 3).

Profile 2 passes through units A, B, D, E and F. Unit C is missing in the sediments of squares 3 and 4 or is poorly represented. Average sediment characteristics for the various units are shown in Table 3. Unit A is similar in test pit 3 as in test pits 1 and 2 while unit B appears a little coarser (mean grain size is 1.6ϕ equivalent to medium sand compared to 1.9ϕ), not as well sorted (2.7 compared to 1.9ϕ), negatively rather than positively skewed (-0.1 compared to 0.3ϕ), and has a slightly more peaked distribution (kurtosis 2.8 compared to 2.5ϕ). Unit D, which contains the bulk of the artifactual material, has a mean grain size of -0.2ϕ, equivalent to very coarse sand, is very poorly sorted (2.7ϕ), negatively (coarse)-skewed (-0.1ϕ), and very leptokurtic (2.8ϕ). By contrast, the mean grain size of unit E is fine sand (2.0ϕ), the sediment is poorly sorted (2.8ϕ), has a nearly symmetrical particle size distribution (skewness -0.04ϕ) and is extremely leptokurtic (3.8ϕ). The basal unit F has the coarsest sediments in the sequence with a mean grain size of -2.2ϕ equivalent to fine gravel. It is very poorly sorted (3.4ϕ), very positively (fine)-skewed, and very platykurtic (0.5ϕ) indicating a wide range of particle sizes (Fig. 10).

Palaeoenvironmental Inferences

Because of the scarcity of fauna, the results of the

Table 3. Average particle size characteristics of sediment units A-F at Rhino Cave.

Square/Unit	Particle Size Characteristics (ϕ units)					Sand Fraction Percentages	
	Mean	Sorting	Skewness	Kurtosis	Gravel and small cobbles (% sediment)	Very coarse and coarse sand (% sand fraction)	Medium, fine and very fine sand (% sand fraction)
Squares 1&2							
unit A	1.93	1.69	0.26	2.19	1.4	18.1	81.9
unit B	1.87	1.90	0.28	2.55	3.4	18.5	81.5
unit C	1.90	2.19	0.27	3.01	3.3	22.2	77.8
Square 3							
unit A	1.98	1.66	0.22	2.15	1.8	16.5	83.5
unit B	1.61	2.67	-0.11	2.80	12.9	18.6	81.4
unit D	-0.24	3.50	-0.49	0.63	39.5	12.8	87.2
unit E	1.99	2.76	-0.04	3.76	9.2	12.5	87.5
unit F	-2.18	3.37	0.46	0.52	56.2	14.1	85.9

sediment analysis are of major importance in interpreting the palaeoenvironmental record at Rhino Cave. As mentioned previously, the Rhino Cave excavations have revealed a cave stratigraphy consisting of a series of overlapping wedge-shaped sediment units thickening towards the northwest away from the entrance to the rock shelter (Figs 4 & 5). The geometry of these units suggests that much of the sediment in the shelter was transported through the entrance by gravity, water or wind. The coarsest material was probably produced by chemical/ mechanical weathering (including frost weathering) of the shelter walls and ceiling, and of the rocks above and around the cave entrance. Logically, finer-grained, positively-skewed sediment units should equate with drier conditions when more material was transported into the shelter by wind. Under wetter conditions the input of aeolian sand and silt should be reduced due to a denser vegetation cover on the nearby dunes and rock surfaces. Wetter conditions should also lead to a greater accumulation of coarse material produced by increased break-down both within and outside the shelter. Furthermore, under wetter conditions we might expect rock fragments to be more rounded than would be the case under drier conditions. Increased runoff into the cave will carry coarse rock fragments that will be deposited on the cave floor where water flow velocities are reduced. The particle size most easily entrained by running water is 0.2 mm (fine sand of diameter 2-3ϕ) while that most easily entrained by wind is 0.08 mm (very fine sand of diameter 3-4ϕ) (Bagnold, 1941; Sundborg, 1956). Logically, therefore, coarse, negatively-skewed sediments in Rhino Cave should equate with somewhat wetter conditions while fine, positively-skewed sediments should reflect drier climates.

As Figure 8 shows, units A-C in squares 1 and 2 are unimodal being composed largely of medium and fine sand with gradually decreasing percentages of coarser material to fine gravel size. By contrast, units A, B, and D-F in square 3 are either strongly (units D and F) or weakly (units A, B and E) bimodal with peaks in the medium and fine sand range and peaks in the small cobble to coarse gravel range. In terms of sand content alone, all units are dominated by medium, fine and very fine sand (77.8-87.5%) with lesser amounts (12.5-22.2%) of very coarse and coarse sand (Table 3). Most of this sand is probably of aeolian origin. The bimodality of units A, B, and E in square 3 is probably related to the proximity of this square to the cave entrance where there is an increased likelihood of coarser particles entering the cave and being incorporated into sediments even during relatively dry intervals. Units D and F, however, are so strongly bimodal, with 39.5% and 56.2% gravel and small cobbles respectively, that it seems likely that these units accumulated under different conditions from those prevailing when the other units were laid down (Table 3). In essence, the input of aeolian sands during deposition of units D and F was extremely slow allowing accumulation of considerable thicknesses of coarse fragments derived from weathering of the local bedrock. This implies that much wetter and possibly

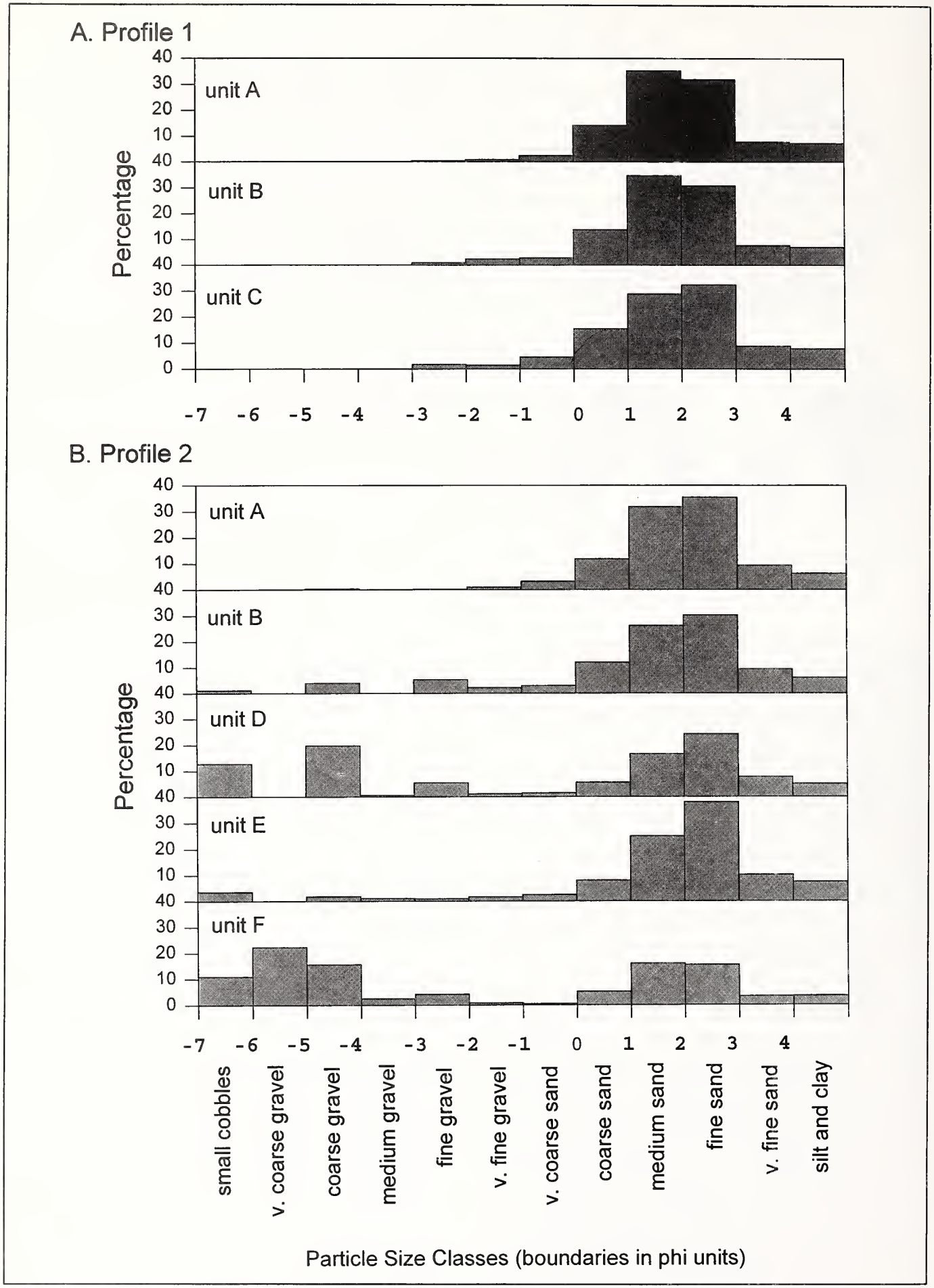

Fig.8. Grain size-frequency histogram for units A-F in sediment profiles 1 and 2.

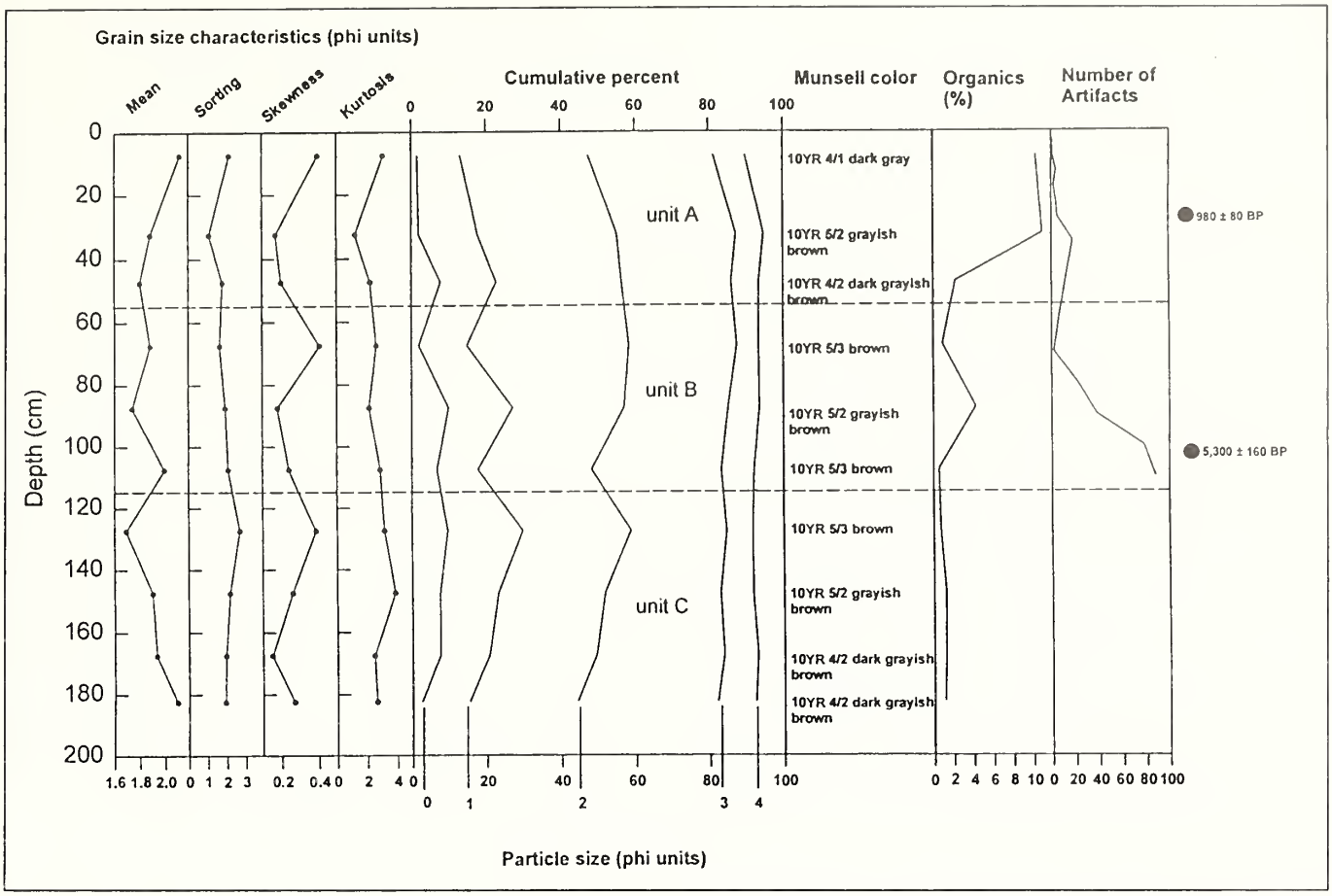

Fig. 9. Sediment characteristics and artifacts in units A-C of profile 1 through squares 1 and 2.

colder conditions existed when unit D (containing the main MSA deposits) was deposited, than when units A-C and E were deposited, a fact born out by evidence of highly weathered quartzite fragments in unit F, which impart a localized yellow/orange color to this unit. It is possible that increased moisture coupled with lower temperatures and more frequent frost may have influenced the breakdown of the quartzite along fractures and grain boundaries during deposition on units D and F. On the other hand, unit E almost certainly represents an arid phase when the input of aeolian sands into the cave far exceeded the production of coarser debris, so that this unit is dominated by medium and fine sands. Unit E has a much lower gravel and small cobble content than units D and F and is more like units A-C than units D and F.

Frost breakdown cannot be ruled out as a cause of the accumulation of angular debris in Rhino Cave in the past. At the present time Shakawe, 46 km northeast of Tsodilo, has a mean annual temperature of 22.5° C and exper-iences an average 3 winter ground frosts per year with the lowest recorded temperature (1959-85) being -7.5° C. Maun, some 220 km to the southeast has a mean annual temperature of 22.6° C and experiences an average 10 ground frosts per year with the lowest recorded temperature (1959-80) being -5.8° C (Bhalotra, 1987). If temperatures in southern Africa during the last glacial period were as much as 5.3 to 6.0° C lower than now (Heaton *et al.*, 1986; Talma *et al.*, 1974; Stute & Talma, 1997), then frost was probably requente ouhin northern Botswana to cause substantial rock disinte-gration. Some of the large angular fragments of units D and F may, therefore, have been produced by frost when sufficient moisture was available to make the process effective.

XRD analysis shows similar clay minerals in the nine samples analyzed. All contain kaolinite, mica, a 2:1 mineral, and pyrophyllite. Mixed-layering is indicated by the low-angle shoulders on the mica and kaolinite reflections in units A and B of Profile 2 (Fig. 11). This appears to be the most significant difference between the samples. The presence of mixed layering may reflect the exposed position of the shallow sediments in Profile 2 in respect of the cave entrance. It is likely that this part of the cave floor receives more moisture than other parts and this may have resulted in some additional weathering of the clays blown into the cave from outside. That all of the samples are similar in clay content suggests that they originated from a similar source and were emplaced in the cave by the same process. It seems likely that the clay minerals were transported to the cave by wind from the dunes that surround the Tsodilo Hills or from rock outcrops of the Hills themselves.

The four radiocarbon ages for the Rhino Cave

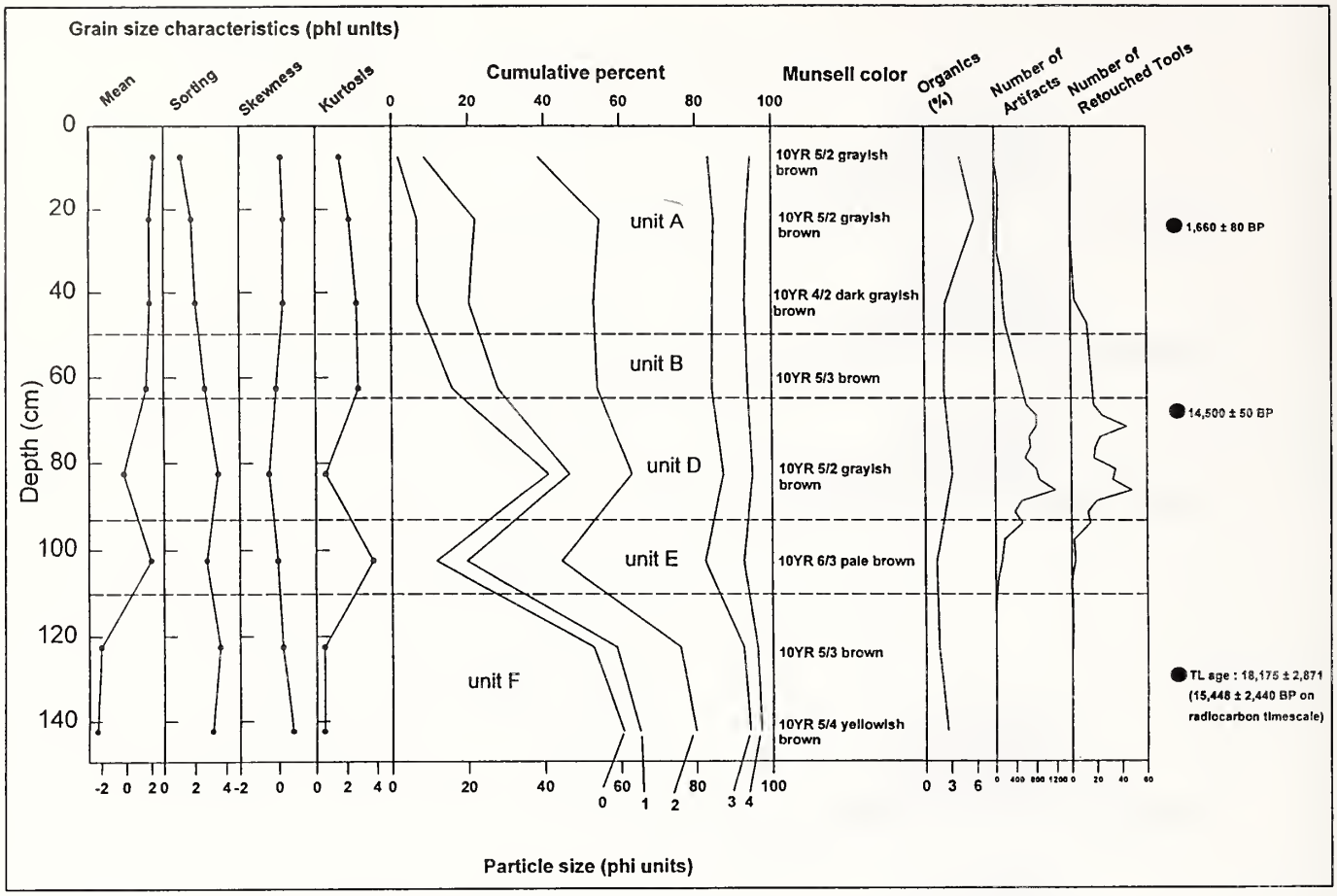

Fig. 10. Sediment characteristics and artifact concentrations in units A-B and D-F of profile 2 through square 3.

sediment sequence indicate that units A-C were deposited within the last 14 500 years. Unit A is late Holocene as indicated by charcoal ages of 980 ± 80 and 1660 ± 80 BP and unit B mid Holocene based on a single charcoal age of 5300 ± 160 BP. Unit C was deposited some time between 14 500 ± 50 and 5300 ± 160 BP and we believe that it is probably of early Holocene age. The unit C sands are characterized by irregular, indurated, clay-rich bands up to 0.5 cm thick which slope towards the north wall of the shelter. Similar clay deposits have been observed in El Garrah Cave in the hyperarid Western Desert of Egypt by one of us. These are deposited by occasional heavy rains which pond in the lowest levels of the cave. The runoff waters carry fine silt and clay from the surrounding area which are deposited as a thin layer across the flooded portion of the sandy cave floor (at El Garrah sand on the cave floor is more than 6 m thick). We believe that units A-C record three pulses of aeolian deposition in the rock shelter in the early, mid, and late Holocene. See Brook *et al.* (1999), Thomas *et al.* (1997) and Blümel *et al.* (1998) for comparative data on aeolian deposition during the Holocene. The upper surfaces of units D, C and B, dating to >14 500, 5500 and 2000/2500 BP, are considered to record periods of reduced Aeolian input to the cave during wetter climatic times when dune and hill surfaces at and near the Tsodilo Hills were less susceptible to deflation because of a denser vegetation cover.

Detrital sand and silt in a stalagmite from Drotsky's (Gcwihaba) Cave located to the southwest of Tsodilo, suggests that there were marked drier intervals in Botswana ca AD 300 and AD 800 with wetter intervals centered near AD 500 and AD 1000 (Robbins *et al.* 1996b; Railsback *et al.* 1999). The wet intervals appear to correlate well with the occupation of the Divuyu and Nqoma villages, with the period of specularite mining at the Tsodilo Hills (Robbins *et al.* 1998), and with the two ages for charcoal recovered from Unit A at Rhino Cave. This suggests that the upper part of Unit A was deposited during the drier interval centered at AD 800 and the lower part during the drier interval at ca AD 300.

The aeolian deposition seen in units A-C at Rhino can be discussed in relation to data at Shakawe. Present mean monthly wind velocities at Shakawe, 46 km from Tsodilo, are highest in March when they are 0.8 m/sec at 2 m and 1.3 m/sec at 10 m (Bhalotra, 1987) but are generally not strong enough to move substantial quantities of sand. At Maun, 220 km to the southeast, they are highest in October (2.4 m/sec at 2 m and 3.8 m/sec at 10 m) and frequently attain speeds capable of moving sand - as anyone who has walked the streets of Maun can attest. Winds at Shakawe are predominantly from the east (21%), southeast (10.1%), and south (8%), and to a lesser extent from the north (8%) and northeast (5.2%), while those at Maun are predominantly from

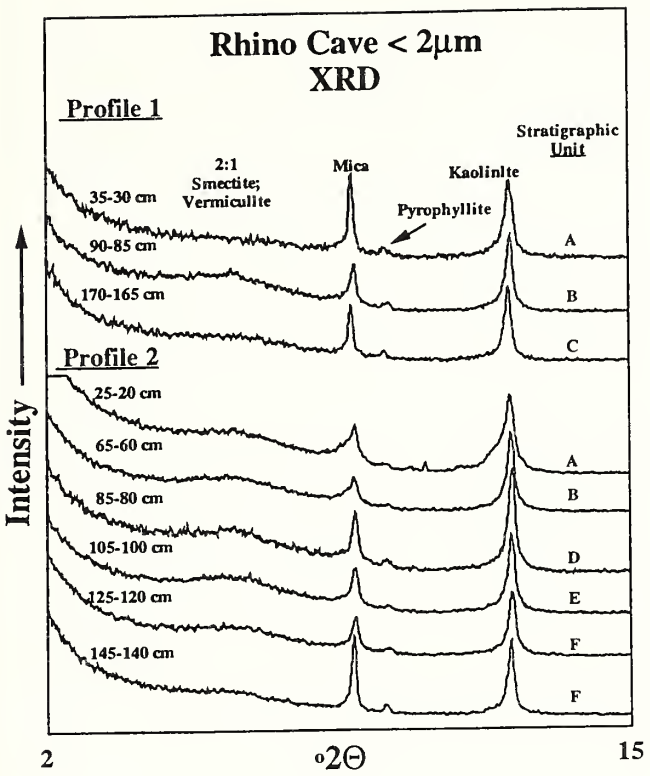

Fig. 11. Clay mineral diffractograms for sediments in units A-F.

the east (20.1%), northeast (16.5%), north (12.3%), and southeast (11.2%). At Maun the easterly and north-easterly direction is predominant in all seasons (Bhalotra, 1987). As Figure 1 shows, Rhino Cave is sheltered from the effects of easterly and southeasterly winds but would be directly in the line of strong northeasterly winds funneling into the northeast-facing valley leading to the cave. The October and January wind regimes at Maun, with 17.7% of winds coming from the northeast, might bring about deposition of aeolian sands at Rhino Cave. It is possible that during the Holocene there were times when, under slightly drier conditions, the winds at Tsodilo were stronger than now and more from the northeast. It is also possible that Rhino Cave was sheltered by the Male and emale Hills from the sand-transporting winds that produced the east-west-trending linear dunes in the Tsodilo area. In fact, as Lancaster (1981) points out, sand is piled up against the eastern side of the Tsodilo Hills, whilst to the west there is an area free of dunes that extends for almost 40 km. If the wind regime during linear dune construction did not include a strong northeast component, sand was probably not transported into Rhino Cave at these times. This being the case, aeolian sediments in Rhino Cave may not mark the driest episodes in the region's history but may simply reflect times when rainfall was lower than present and winds were stronger and more from the northeast. According to Lancaster (1981) there may have been a strong northeast sandflow west of the Okavango Delta when the dunes of the southwest Kalahari were forming (see Lancaster 1981: fig 9c). As this region experienced multiple periods of Holocene dune development, it would seem reasonable that sand might be blown into Rhino Cave during the same intervals. Lancaster also notes that this wind regime closely resembles the modern October pattern, a situation which may prevail for longer in modern drought years.

Unit D is in marked contrast to the three Holocene units. As noted above, a radiocarbon date of 14 500 ± 50 BP for charcoal in the upper part of the unit appears too young given the content of MSA artifacts. However, in square 1, unit C overlies an artifact-rich, angular pebble layer, 3-5 cm thick, resting on the north-sloping upper surface of the large boulder (Fig. 5). If unit C is early Holocene, as suggested, the 14 500 BP date is reasonable for the upper surface of unit D. The TL age of 15 448 BP for unit F appears much too young given a likely date for the MSA/LSA boundary of about 30 ka BP (Brooks *et al.* 1990). If the MSA use of the site follows that of its use during the Holocene, this suggests wetter climates at the times of high artifact frequency separated by a drier interval.

SUMMARY AND CONCLUSIONS

The 1995 and 1996 excavations at Rhino Cave have demonstrated that the site was used over an extensive period. The stratigraphy consists of six wedge-shaped units (A-F) thickening away from the shelter entrance. The upper three units consist of aeolian sand deposited during pulses of aeolian activity in the early, middle and late Holocene. The timing of these pulses agrees well with information from other parts of the Kalahari suggesting three Holocene dune-building episodes in the region, particularly in the southwest. In the wetter conditions separating these aeolian phases sedimentation in the cave likely slowed substantially. The upper three units contain LSA artifacts. Unit D is of pre-Holocene age and its content of MSA artifacts suggests accumulation over a lengthy period. The underlying units E and F suggest, respectively, drier/aeolian and wetter conditions than today.

The 1996 excavations revealed a more complex stratigraphy than was expected based on the 1995 work. Artifacts were especially dense in the deposits of square 3 situated between two large rocks. The earliest occupants were MSA peoples who carried out extensive "flint knapping" at the site using non-local materials as well as locally available quartz. Some of the points recovered are quite exceptional because of their small size and because they were made in an identical way, the bases being corner struck (Robbins *et al.* 1996a). Although the dating of the MSA at Rhino Cave is problematic, there do appear to be some changes in artifact characteristics within the deposits regarding the clustering of distally backed pieces and small core/steep scrapers. Further work might clarify the dating, as well as enable firm correlation of the Late Pleistocene

sedimentary record (units D, E and F) with other localities in southern Africa.

LSA deposits were abundant above the MSA in square 2 excavated in 1995, but similar LSA levels were not found in square 3 excavated in 1996. While the LSA was concentrated in square 2, we cannot entirely rule out compacting/admixture of such materials in the adjacent sloping square 3 uncovered in 1996. However, it is interesting that the comparatively high density of LSA materials occurs in an area that is slightly closer to the painted wall of the shelter.

Finally, Rhino Cave was used periodically during the period when Tsodilo was settled by Early Iron Age peoples. Traces of pottery (first found in the 1996 excavations), nutshells, bone fragments and a scattering of debitage in an ashy context marks this period (ages of 980 ± 80 and 1660 ± 80 BP). Use of the site for rituals in connection with the rock art may have occurred during this period. The numerous wall depressions or 'cupules' found at the site on the wall opposite to the paintings remain enigmatic in relation to age and function.

ACKNOWLEDGMENTS

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THE IDENTIFICATION AND SIGNIFICANCE OF CERAMIC ECOFACTS FROM EARLY IRON AGE NDONDONDWANE, SOUTH AFRICA

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ABSTRACT

This paper reports on some unusual ceramic objects recovered during the most recent excavations at the Early Iron Age site of Ndondondwane in KwaZulu-Natal, South Africa. Our analysis suggests that the objects are a consequence of earthworms and termites living in human activity areas during the occupation of the site. The by-products of this interaction provide indirect sources of evidence for ancient biotic activity at Iron Age sites. In this paper, we discuss the methods used to identify these objects and their ecological and cultural significance. It is stressed that a detailed analysis of these objects provides a zooarchaeological proxy record that can enhance our understanding of local ecological processes, archaeological site formation, and the presence of cultigens on Early Iron Age sites.

INTRODUCTION

Ndondondwane ceramics composed a new stylistic phase in the regional Iron Age ceramic sequence (ca AD790-970). The ceramic typochronology, secured by radiocarbon dates, identified the Early Iron Age occupation of Ndondondwane during the eighth century AD (Maggs 1984c). Further excavation in the early 1980s uncovered a livestock enclosure, iron smelting and ivory working areas near the river, and a contemporary midden to the east of this (Loubser 1993).

Excavations were recently conducted at Ndondondwane from 1995 until 1997, followed by extensive analysis of the recovered artefacts and ecofacts (Greenfield 1996, 1997, 1998, 1999; Greenfield *et al.*1997; Van Schalkwyk *et al.*1997) (Fig. 1). The objective of these excavations was to collect spatially representative samples of data from an Early Iron Age settlement to test models of intra-settlement socioeconomic organization. This site was chosen for study because it was a single-phase settlement occupied for a comparatively short (<100 years) duration of time. This has resulted in less pronounced settlement drift, or temporal and spatial changes in activity areas, which is uncharacteristic of other Early Iron Age settlements in the region (*e.g.*, Maggs 1984b; Whitelaw; 1994 Lane 1998). As such, Ndondondwane has not experienced many of the same depositional process typical of other multiphase

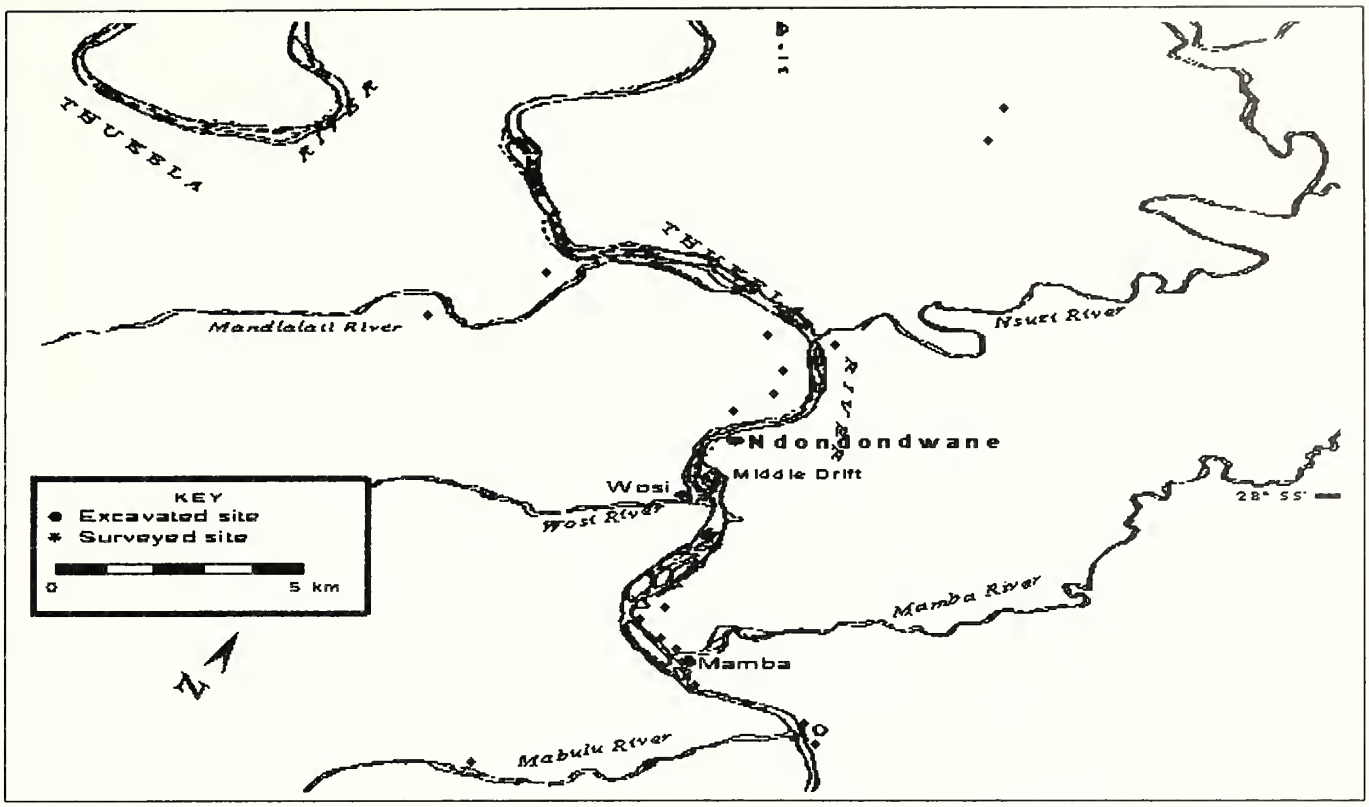

Fig. 1. Map of the Lower Thukela Basin study area and the location of Early Iron Age sites.

Early Iron Age settlements (*e.g.*, Marker & Evers 1976; Hall 1981, 1984; Feely 1987). Because the site held potential to provide a finer 'picture' of both the lateral displacement and vertical superposition of cultural stratigraphy, it was possible to pay more detailed attention to the potential effects non-cultural post burial processes had on the development of the site.

The most recent excavations at Ndondondwane expanded on work in previously excavated areas and investigated new areas of the site (Greenfield 1998, 1999; Greenfield *et al.* 1997; Van Schalkwyk *et al.* 1997). The new excavations have identified a series of spatially discrete activity areas that can be divided into two major zones (Fig. 2): a central zone surrounded by an arc of peripheral activity areas. The central zone is composed of three activity areas arranged about 40 m from each other in a line from north to south: a livestock enclosure (Dung Area), a large hut floor (Transect 1), and an area (Mound Area) reserved for iron smelting, ivory working, and possibly ritual activities (with clay mask fragments, human figurines, *etc.*). Arranged in an arc to the east of the central zone, separated by a large apparently open space of some 100 m, are a series of domestic activity areas (Middens 1 to 3). A fourth activity area used for charcoal and iron ore preparation is located at the southernmost end of the zone.

CERAMIC ECOFACTS

Numerous unusual specimens of baked clay rich soil were identified from the most recent excavations at Ndondondwane (n =150). They were originally thought to be and were catalogued as fragments of "figurines" because of their general similarity to the "figurine legs" reported by Loubser (1993:132-133, fig. 35). However, after closer examination, it was realized that they are not figurines. Instead, many were similar in size and appearance to the "figurines" that fit into reed cross-sections reported by Dreyer (1996:101, fig. 6) at Riet River in the southwestern Free State. Other specimens were much smaller. To aid in the identification of these objects, analysis focused upon the physical and mineralogical properties of the objects and their morphological characteristics.

The objects fall into two morphologically distinct groups with different physical and mineralogical properties. These properties are useful in identifying their origin and explaining their occurrence at Ndondondwane. The prevalence of these particular objects at other Early Iron Age sites is unknown since they have never been described before.

Baked earthworm faecal casts

Properties

Included in the first group are narrow, tapered cylindrical fragments of variable thickness along their extent (Fig. 3A). They range from 15-25 mm in length, centre around 6 mm in circumference, and can taper from a 'head' to a 'tail' often by as much as 2-3 mm. The surface colour of the objects ranges from reddish yellow (Munsell 5 YR 6/6) to light brownish grey (Munsell 7.5 YR 6/2). In cross-section, each has a distinct black-grey 'core effect' surrounded by a ring the same colour as the surface of the objects (*i.e.*,

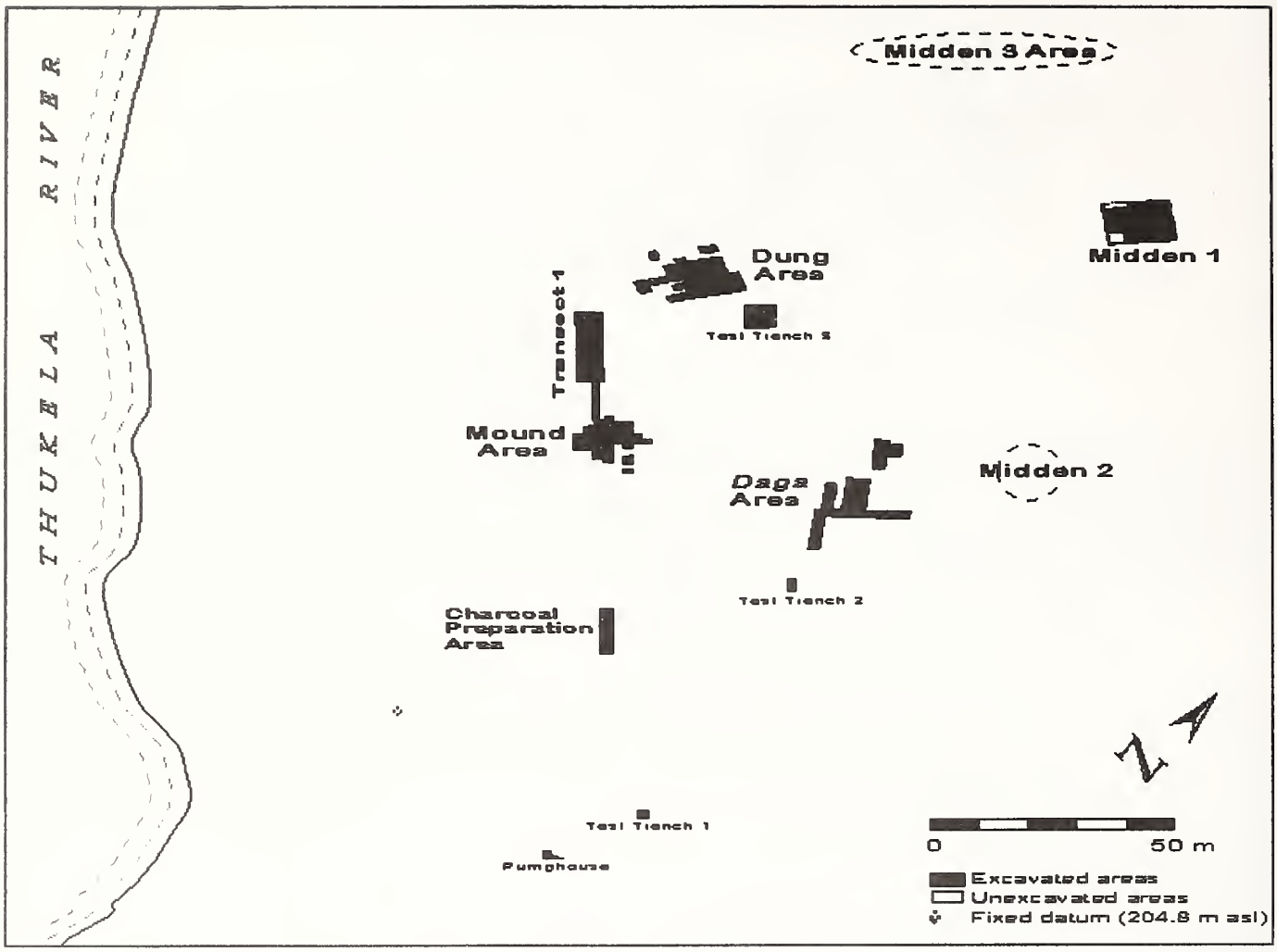

Figure 2. Site plan of Ndondondwane.

biscuit). The objects have no plainly visible mineral constituents. Microscopic inspection distinguished very small (~0,5 mm) white quartz inclusions and elongated voids. The presence of elongated voids points toward organic material, probably plant matter, having been originally present in the clay matrix (Peacock 1977:30-32).

Not all objects that fall within this morphological category were fired soil. Several similar objects had their matrix of consolidated soil completely replaced by calcium carbonate. In these cases, the calcium carbonate was exposed to heat long enough to fuse the matrix.

These properties are useful for reconstructing firing conditions (atmosphere, temperature ranges, and firing duration). Core effects are characteristic of pottery fired below 1000°C. A sharp margin marking the inner core is indicative of incomplete oxidization in soils with high clay content that likely had organic material originally present (Rye 1981:115), which is confirmed by the presence of elongated voids in the fabric. The objects do not exhibit any surface cracking and are rather hard (Mohs 3.5-4). This suggests that chemically combined water in the soil matrix was allowed to escape as steam (Johnson *et al.* 1988). Slow heating rates in low temperature fires, around or less than 500°C, produce such effects.

It appears that these specimens were fired under oxidizing atmospheric conditions at relatively low temperatures, likely less than 500°C. Very small pieces of plant material (perhaps grass or chaff) were probably in the soil matrix when the specimens were subjected to heat. Fires were also likely of long duration – a scenario where fuel was continually added to open fires, as it often is in cooking fires or in some traditional ceramic firing methods. Whatever the precise means, the firing conditions were adequate to decompose the organic constituents in the specimens, and temperatures were sufficient to make them durable by transforming the clayey soil into a low-quality terracotta ceramic. Their morphology and physical properties indicate that they did not result from precisely the same processes that formed all the objects in the second group.

Identification

The first group of objects are identical with consolidated soil of unfired earthworm faecal casts, and were identified as fired casts of earthworm faecal matter. Their diameter varies around a mean of 6 mm, which is the mean size of adult earthworms in this region (Edwards & Lofty 1977).

A general understanding of earthworm behaviour yields some insight into the transformation of the faecal

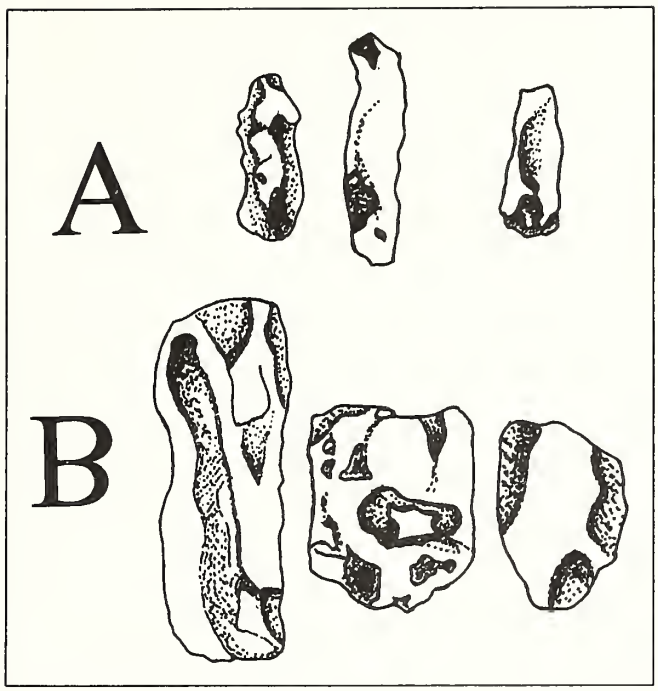

Figure 3. Examples of ceramic ecofacts. A - baked earthworm fecal casts; B - fired *Sorghum* sp. stalk casts.

casts from soil to ceramic. In the process of feeding, earthworms (*Oligochaeta*) ingest soil in order to process organic material. Some species of earthworms live in deep soils and tend to move vertically to and from the surface (*e.g.*, *Lumbricus* sp.), others live within the top 10 cm of soil and prefer horizontal movements, rising only to drop faecal matter and during rains (*e.g.*, *Aporrectodea*). When earthworms rise to the surface to deposit faecal matter, the resulting casts of consolidated soil can become incorporated in fires and/or charcoal/ash dumps. If a fire is built over the casts, they become trapped within the hot embers. The heat produced under these conditions would be sufficient to bake the consolidated soil. It is because faecal matter is deposited on the surface that it gets baked and is therefore preserved in a terracotta form. The preferred movement and other behaviours of various earthworm species can help isolate those that were present in and contributed to the formation of Early Iron Age soils and stratigraphy.

Site Context

The provenance of the terracotta earthworm casts is important for reconstructing pedogenic changes at the site. The faecal casts recovered during excavation were found at different depths and locations.

A total of 38 faecal casts were found in the plough zone (n=37) and cultural horizon (n=1) of Midden 3. This is a deflated midden that had experienced recent ploughing. Because ploughing tends to dislocate objects from their horizontal context more extensively than from the vertical context (Rick 1976; Roper 1976), it is possible that the faecal casts in this area were not originally located in the cultural deposits and are of later or modern origin. There is no preserved evidence of cultural stratigraphy in this area and it is difficult to confidently assign any of the ecofacts found outside pits to the ancient occupation at the site. The single specimen found in the cultural horizon may also be intrusive.

A further 64 faecal casts were recovered from depths between 30-40 cm in the eastern part of the Dung Area. The most recent excavations have isolated two activity zones in the Dung Area: one used primarily by humans in the east and the other by livestock in the west. A stockade wall divides the two zones, and the stratigraphy in each zone is very different.

In the livestock zone (and within the stockade), four strata have been attributed to two temporal horizons (Fig. 4). Each temporal horizon contains a pair of overlying loose and underlying compact dung. The loose dung strata are mixed with ash and charcoal. The Upper Loose Dung stratum is a mix of dung, small charcoal fragments and ash, while the Lower Loose Dung stratum includes only dung and charcoal fragments. In contrast, both compact dung strata are composed almost entirely of decomposed animal dung, but are not uniform over the entire area. In modern byres, compact dung only forms where livestock tend to cluster in an enclosure, and this is often at the lowest elevation in the byre (in this case, towards the west). Thus, compact dung did not accumulate where human activity occurred.

In the eastern half of the Dung Area, uphill from the Livestock zone, is where human activity is clearly attested and where the fired earthworm casts were recovered. It is termed the human activity zone of the Dung Area because there is evidence for the reworking of iron implements (*i.e.*, charcoal and smithing slag) and the dumping of cultural debris (animal bone, pottery, *etc.*). It is also where meat was roasted on many occasions over a bowl-like depression, resulting in the accumulation of much ash, charcoal, and burnt bone within the depression. Three strata were found in this area (Fig. 4):

1. an Upper horizon of loose fine ash;
2. a Middle horizon of coarser ash, mixed with bone and some charcoal; and
3. a Lower horizon of coarse sediment, mixed with large amounts of charcoal and bone. Ceramics are abundant throughout the deposits.

The Upper horizon in the human zone could not be stratigraphically linked to the livestock zone because previous disturbances had truncated its spatial association. However, the association of the other horizons in the human zone of the Dung Area is clearer. The Middle horizon can be stratigraphically linked to the Upper Loose and Compact Dung horizons in the animal zone (15-35 cm depth), while the Lower horizon is linked to the Lower Loose and Compact Dung horizons (35-60 cm depth).

The faecal casts therefore occur within the lower depths of the Middle horizon (ca 30 cm) and the Lower horizon in the eastern Dung Area (ca 35-60 cm). Each of these horizons are linked to two phases (Upper and Lower) in the development of the livestock byre. The

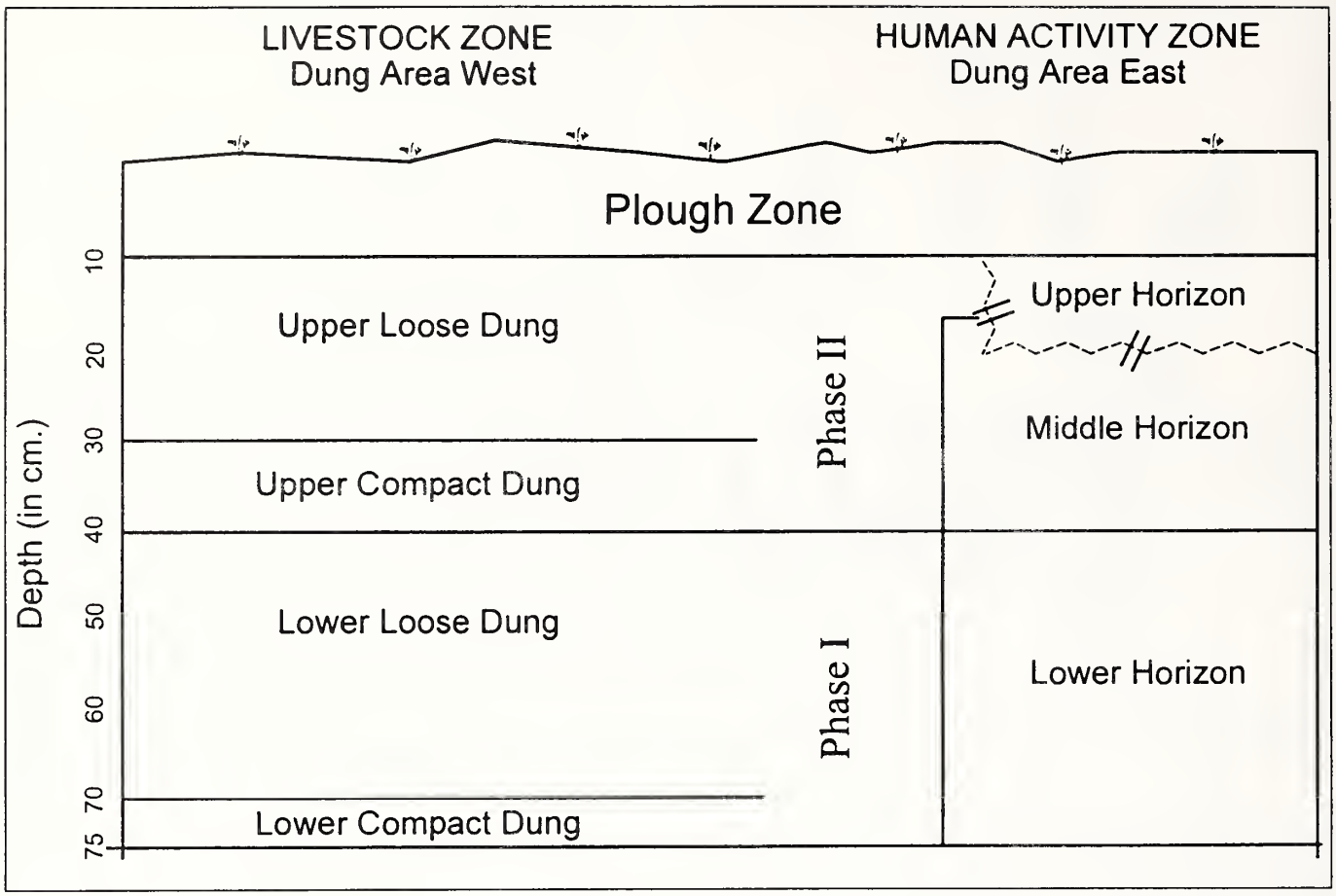

Figure 4. Simplified stratigraphy of the Dung Area at Ndondondwane.

presence of earthworm activity is documented for the entire formational history of this area of the site.

Earthworm Behaviour

Earthworms conduct a delicate balance between temperature, oxygen, nutrition, and density requirements by moving from oxygen deprived environments or inhabiting locales where the topsoil is occasionally mixed, allowing gas by-products to escape. The activity of earthworms would not be out of place in the nutrient rich environment of livestock byre, but it is interesting to observe that the casts are found only in the area with human activities. While the levels of carbon dioxide and other gases may have inhibited earthworm activity in the animal zone where the dung was thickest, particularly on the edges of the byre, this is unlikely for two reasons. First, livestock would have mixed the upper layer of the dung as they moved about the byre, thus releasing gaseous by-products. Second, earthworm faecal casts were not preserved in the livestock zone because no fires were built there.

Because earthworm casts are only deposited on the surface, and because earthworms tend to displace material towards the surface and not the reverse (Edwards &Lofty 1977), it is very likely that these casts were sealed in an archaeological context concurrent with the occupation of Ndondondwane. The casts were probably burnt in the process of either cooking food or smithing iron in the human activity area of the livestock byre. Clearly, these objects provide evidence that earthworms were active in the Dung Area during the occupation (as they are currently), but the unusual relics of their presence were only inadvertently preserved by human activity in the area.

Plant Stalk Casts

Properties

The second group of objects ranges in length from 20 to 40 mm and from 5 to 19 mm in width and have characteristic striations and/or pits running along their extent (FIG. 3B). The surface colours fall under two different hues: specimens are either dark red in colour (Munsell 2.5 YR 3/4, 5/8, 4-5/6) or more reddish yellow in colour (Munsell 5YR 4/1, 5/6, 6/6). There are two fabric types. Some only have small rounded and elongated voids while others have calcite grains and well-rounded quartz and gneiss material (less than 1 mm in diameter). This makes them rather different from Ndondondwane vessels, which primarily have coarse fabrics composed of angular or more rounded quartzite.

In cross section, this group of objects either has a distinct black-grey core effect or a homogenous colouring with no core effect. The darker coloured specimens with a black-grey core effect were incompletely oxidized and probably had organic material present in the matrix. The sharply defined dark grey inner core almost reaches the outer surface suggesting these objects were fired in a reducing atmosphere, cooled rapidly in air and originally contained organics

(Rye 1981: 115). Those without a visible core effect appear to have been almost completely oxidized and may or may not have had organic material present in the original soil matrix. The lighter-coloured specimens have a greyish core with more diffuse margins. This implies they were incompletely oxidized and originally contained organic materials.

This variation suggests that the objects were subjected to different atmospheric conditions: the lighter-coloured ones were subject to an oxidizing atmosphere, but the darker ones were fired in a reducing atmosphere (*i.e.*, oxygen flow was restricted). The nature of the voids indicates that small oolite or limestone fragments (spherical voids) and organics (elongated voids), such as bits of grass, chaff, or straw, composed the original body of the objects before firing (Peacock 1977). Such inclusions will usually burn out around 578°C. It is unlikely that the firing temperature of the objects was any greater than 870°C (Friede 1983; *cf.* also Gosselain 1992).

While the fragments are generally hard (Mohs 4-5), the surface of the darker fragments could be more easily scraped away (Mohs 2.5). Brittleness of the surface is typical of ceramics fired at high temperatures for brief periods (20-30 minutes). These additional data suggest that different coloured specimens were fired at different temperature ranges. Darker-coloured specimens with more brittle surfaces were fired briefly at high temperatures in a reducing atmosphere then cooled rapidly in the open air. The lighter-coloured ones have harder surfaces and are more similar to the fired earthworm casts. These were fired longer in an oxidising atmosphere at lower temperatures. It is also noteworthy that the types of clays present at Ndondondwane (iron-rich kaolin clays) have low shrinkage, and when fired in this temperature range quartz can act to reduce firing shrinkage (Rice 1987:96). This suggests that all of these specimens are at or very near their original dimensions, despite being fired under different atmospheric conditions.

Identification

Similar objects were found in the Riet River excavations (Dreyer 1996:101-102, fig. 5). Dreyer concluded that these were the remains of soil baked after accumulating in plant stalks because they fit within the interstitial spaces within modern reed (*Phragmites* sp.) stalks growing near the site. Therefore, the outer surfaces of these objects are casts of the interior of the particular plant in which they formed. In comparing the Ndondondwane specimens to those from the Riet River excavations, our specimens were observed to be of similar size but with different morphological characteristics. However, the Ndondondwane specimens are larger than the modern reeds in the basin. It is unlikely the Ndondondwane specimens are from modern reeds in the lower Thukela basin because reedswamp communities (*Phragmites communis*) are heavily stunted due to over-grazing, abrasive river flow, and overuse by the rural population (Van Schalkwyk 1991). Nevertheless, it is most plausible that the archaeological objects from Ndondondwane represent soil baked after accumulating in plant stalks.

Based on these observations, we must also consider the possibility that these specimens represent soil accreted in other plant stalks and are intrusive to the Early Iron Age levels of the site. In his excavations, Loubser (1993:111) observed that modern maize was planted across much of the site. In areas with high ash content or cultural remains (*i.e.*, the Mound Area), a mature maize stand was stunted in height. Even though these mature maize stalks are smaller, the size and morphology of their interstitial spaces still does not match that of our specimens.

The Ndondondwane specimens did not match the morphological characteristics of the interstitial space in other modern maize stalks (*cf.* Freeling & Walbot 1994). The archaeological specimens were somewhat smaller than modern maize. It is unlikely that these specimens came from post-eighteenth century maize stalks because (1) there is no historical or ethnographic evidence for maize cultivation in this area prior to the twentieth century and (2) the specimens are too small to have been accreted in maize and too large to be formed in millet. The specimens best fit the size and shape of the interstitial spaces of sorghum stalks. Consequently, we argue that the composition and morphology of these terracotta objects represent soil baked while within the stalks of a *Sorghum* sp. stand.

Termite Behaviour

One phenomenon in particular seems to us the most plausible explanation for the manufacture of the plant stalk casts. Termites (*Isopteria* sp.) carry soil up the stalk of maize, sorghum, or millet plants while creating runnels (termite burrows). Once abandoned by the termites, these accretions remain within the stalk of the plant. If fired at sufficiently high temperature, the soil-filled stalks bake and drop to the ground. They would then be incorporated into the archaeological site by sediment deposition above them. The result is a ceramic object created as a consequence of termite activity.

Van Schalkwyk and Greenfield observed the results of a similar formation process during the 1995 field season at Ndondondwane. During this first field season, hollow maize stalks still standing in the southeastern area of the site from the 1993-1994 growing season were burnt off prior to survey and excavation. As the stand burnt, the soil termites accumulated in the base of the stalks began to bake and subsequently fell to the ground among the still burning stalks and grasses in the maize stand. The casts were covered over by the maize stalks and grasses creating a rudimentary, but effective, reducing atmosphere. Once the fuel was exhausted, the stalk casts rapidly cooled in the open air. This resulted in very same physical properties described for the archaeological examples above. After being fired, the exterior of the casts permanently took on the characteristics of the interior structure of the maize plant.

The evidence for termite activity at Ndondondwane

is extensive. Both modern and ancient mounds or *termitaria* were found on the site. Large modern termite mounds, probably constructed by *Macrotermes subhyalinus* (Coaton *et al.* 1972; *cf.* Meyer 1997), were scattered among the dense brush or at the base of trees covering the eastern half of the site. The bases of ancient *termitaria* were excavated in two areas of the site. Based on their size, they were probably constructed by the same taxon. In the Dung Area at the northeast edge of the human activity zone, the base of a large termite mound extended from just beneath the plough zone deep into the sterile substrate disturbing the cultural horizons in a 2 x 2 m area. It extended to a depth of almost 50 cm beneath the modern surface. The base of another smaller *termitaria* occurred in Midden 3, at the western or down slope edge of the midden. It was found within 10 cm of the surface, and was approximately 1.5 m in diameter. The depth was not ascertained because the midden deposit was deflated and all cultural remains lay within 20 cm of the surface. It is interesting to observe that both of the ancient termite mounds were located on perimeter of human activity areas. This should not be surprising since termites tend to locate their mounds near the bases of trees or stumps (Ferrar 1982; Meyer 1997), which might have been left around the perimeter of different activity areas within the settlement to provide shade.

We must note, however, that plant stalks may be preserved in much the same way as the earthworm faecal casts if crop stubble was collected for domestic fuel after harvest. In this case, the soil-filled stalks would be subjected to low temperature, oxygen-rich fires for a relatively long duration of time. Such a scenario would account for the differences observed in the colour, hardness, and surface texture of the stalks described above, as well as where they were found (discussed below). Either of these processes, which combine termite activity and heat, can preserve evidence of *Sorghum* production at sites.

Site Context

The plant stalk casts, which can now be described more properly as fired casts of *Sorghum* stalks, were recovered from two groups of contexts at the site:

1. From modern or uncertain provenance in the plough zone of Midden 3. A number of stalk casts found in Midden 3 (n=20) were covered by a shallow plough zone (~ 5 cm). These stalks were found in the same strata as the earthworm faecal casts described above. It is also possible that the stalks in Midden 3 were not originally located in the cultural deposits in the area.

2. From stratified contexts at the site. Specifically, stalk casts were found in the cultural horizons of Transect 1 (n=1) 80-90 cm from the surface; the Dung Area (n=1) in the Middle Horizon, 30-40 cm from the surface; the cultural horizon (n=2) 10-15 cm below surface, and Pit 2 (n=1) in Midden 3; and in the cultural horizon of Midden 1 (n=1) some 15 cm below the surface. Only the objects from these contexts can be placed with any degree of certainty within the Ndondondwane occupational phase.

Based on these data and observations, we propose that the stalks of *Sorghum* represent the crops cultivated by the inhabitants of Ndondondwane. Regardless if the fields were burnt intentionally or as a consequence of wild fires, the fired sorghum stalks recovered at Ndondondwane were subsequently deposited in nearby charcoal/ash dumps located in the livestock enclosure (e.g., from a thin ash lens in the Upper Compact horizon in the Dung Area – Greenfield et al. 1997, 1998; van Schalkwyk et al. 1997) and nearby residential middens, probably after preparing fields for a new planting season.

DISCUSSION

The presence of fired plant stalks and earthworm faecal matter at Ndondondwane tends to confirm the observation that not all Iron Age ceramic objects may be the result of human manufacture. Human activity may only be secondary or tertiary to the creation of the final product. In the above discussion, it was stressed that people were not purposefully involved in manufacturing the objects, but cultural activity may have indirectly played a role in their preservation. Thus, the terracotta earthworm faecal casts and sorghum plant stalk casts can properly be termed ecofacts in more than one sense of the term: they are preserved evidence of plant remains and invertebrate faunal activity, and have contributed towards understanding the nature of soils and sediments in riverine contexts, particularly when they have been subjected to heat input by domestic or grass fires. To this point, the discussion had focused on the genesis of the ceramic ecofacts. These objects also have several important implications for Iron Age research in this region, which are discussed next.

Identification

The methods used to identify these objects should be of considerable interest to archaeologists working in southern Africa and in subtropical climatic regimes elsewhere. Such objects likely form part of recovered archaeological assemblages, but have not been previously recognized. It is worthwhile to make the effort to identify them because of the wealth of information that they can provide about a site and its history.

It is particularly important to make the effort to identify such ecofacts, especially in those areas with either a poor history of botanical recovery due to methodology or preservation conditions. For example, at Ndondondwane, carbonised millet seeds were found (Maggs 1984c). Despite the extensive flotation of the ash deposits at Ndondondwane, no carbonised sorghum seeds have yet been identified (T.Jongsma, pers. comm. 2000). It would appear that any potential evidence was

incinerated. More broadly, only 36 Iron Age sites throughout eastern and southern Africa have reported evidence of preserved grains (Reid & Young 2000). It would appear that even though the conditions for the preservation of carbonised grains may exist on such sites, they are not always likely to be found. Other more indirect sources of information must therefore be sought.

To identify the ceramic ecofacts, two sources of information were drawn upon.

1. Ceramic Classification. The analysis of the ceramic data from the excavation at Ndondondwane included all ceramic objects – from vessels to figurines to the more enigmatic objects discussed in this paper. If this assemblage had been examined using traditional methods of ceramic analysis in southern Africa these objects would not have been identified. It is noteworthy that many of these objects were identified or recovered from previously excavated areas. Further, a consideration of the mineralogical composition and morphology of the Ndondondwane ceramic assemblage allowed the fired plant stalks and earthworm faecal matter to be singled out as atypical objects in this and other ceramic assemblages in the region. A more detailed consideration of the physical properties of the stalk and faecal casts permitted a reconstruction of the probable conditions under which the objects were transformed from the clayey soils characteristic of the site into low-quality terracotta ceramics.

2. Field Observations. Dreyer's (1996) astute observations at Riet River provided that starting point to begin thinking about the origins of the ecofacts. Subse-quently, the burning of the old maize stand in preparation for excavations at Ndondondwane in 1995 yielded unexpected insights into the processes that formed the archaeological plant stalk casts found at Ndondondwane. While fired casts might immediately be seen as "curiosities" of common biotic activity at subtropical archaeological sites, they also have taphonomic and behavioural significance.

Pedogenic and Depositional Processes

The ecofacts identified at Ndondondwane provide evidence for ancient biotic activity at Iron Age sites. They are an under-investigated proxy record of the pedogenic and depositional processes affecting these settlements.

Pedogenic Processes

Earthworms and termites change the nature of the soil they inhabit. Both taxa consume soil and excrete or regurgitate it. Earthworms help to keep soil horizons soft, while termites make it more compact.

Earthworms burrow by pushing soil aside or consuming the soil before them. They either leave their castings behind or on the surface. In effect, earthworms displace soil by consuming it and excreting as they move vertically and horizontally through soil horizons. The excreted soil is crumbly and helps to form the A soil horizon. They keep the A soil horizon from becoming too compacted (Wood & Johnson 1978; Stein 1983). Since earthworms will pass soil material in an area through their system every few years, they effectively churn the soil of an area over time. While some earthworm species in the region, such as the common dew worm (*Lubricidae* sp.), prefer deep soil and vertical movement, other species such as the African nightcrawler (*Eudrilus eugeniae*) or the manure worm (*Eisenia foteida*) inhabit shallower depths and tend to move horizontally (see Edwards & Lofty 1977). Earthworms with shallow burrowing behaviour were found across the site of Ndondondwane during excavations. The Dung Area stratigraphy is such that there is no substantial mixing or blending of the various strata, except at the northern edge where a termite mound was found. In this one location, the strata were obliterated by termite activity. Although earthworms were present in the eastern Dung Area of Ndondondwane, it appears that their activity did not substantially alter the archaeological stratigraphy in the area. Therefore, the African nightcrawler and manure worm are the best candidates for the species once active at Ndondondwane.

Termites displace soil by moving it from one place to the next in the process of constructing *termitaria*. They bring fine earth subsoil fractions to the surface and mould structures from the soil and organic matter. During the construction of the above and below ground extensions of *termitaria*, termites consolidate the soil. Termites make a paste of soil, saliva, and a sticky solution secreted by the frontal gland. In effect, the soil and organic particles are glued together to form a dense hard matrix. The subsurface extensions of *termitaria* are often preserved on archaeological sites and are easily identified as a dense hard matrix similar to dried cement. New termite mounds are created every few years, and tend to be relocated in relatively close proximity to abandoned ones (Lee & Wood 1971; Wood & Johnson 1978). Therefore, termites can modify the entire soil of an area over a period of time (McBrearty 1990). An illustration of the effect of termites on cultural strata comes from the Dung Area and Midden 3. The cultural strata in those parts of the Dung Area and Midden 3 where termite mounds were identified were obliterated.

Depositional Processes

Beyond the mixing and movement of soil done by earthworms and termites, they can also have a profound effect upon the preservation of archaeological artefacts and features. This is particularly true of earthworms.

Earthworms affect archaeological deposits in four ways. They may create false artefact concentrations by moving archaeological debris down to the bottom of the

zone they live in (Limbrey 1975; Butzer 1982). They may bury objects by depositing faecal casts on the surface, slowly burying debris lying on the surface (Limbrey 1975; Butzer 1982; Stein 1983). Some estimates suggest that earthworms can drop as much as 9,600 kg of casts on hectare of surface annually (Wood & Johnson 1982:548, 552). Such action is capable of burying surface material rapidly, preserving its original location. However, this behaviour does not have the same effect on heavier objects as it does on soil. Other field research suggests that certain species of earthworms will blur the distinctions between different sediments and deposit boundaries, but they will not displace material greater than 10-20 mm in diameter (Stein 1983:284, 286). Additionally, earthworms alter texture and chemistry of soils and can destroy ecofacts such as carbonised seed remains by eating them as they move through soils. In some cases, this may explain the paucity of certain seed types recovered in Iron Age archaeological contexts.

Despite the fact that earthworms can move substantial quantities of soil in an area over time, there is little evidence for the formation of overlying sediments above the final occupations. This is simply due to the ecology of the species present. Sediment was moved more laterally than vertically. This is particularly visible in the Dung Area stratigraphy where there was no substantial mixing or blending of the various strata, except at the northern edge where a termite mound was found.

At this point, the best *direct* evidence for earthworm activity comes from the Dung Area. It is certainly not speculative to infer the importance of earthworm activity in decomposing organic debris in the middens. However, it is unknown what effect such activity would have on the arrangement of debris within storage and refuse pits. Potentially, such biotic activity could inhibit our ability to distinguish between episodes of pit use and the discard of cultural debris, making it difficult or impossible to link the use history of different domestic middens to each other and other activity areas in a site.

Termites may also preserve the general location of artefacts. Artefacts are often frozen in place as *termitaria* are built around them. Features, however, are usually destroyed as termites bring up soil and organic material in order to create *termitaria* (McBrearty 1990). They can carry soil grains and similarly sized organic materials to the surface from as far down as 2 m (Wood & Johnson 1978).

It is noteworthy, however, that little is known yet about the effect earthworm and termite activities may have had in all areas of the settlement. Changes in soil texture and colour are deceptively subtle at Ndondondwane within the identified soil horizons, apart from middens. Yet, in middens, where much accumulation of organic debris is found, erosion, deflation, modern ploughing, and other taphonomic processes often masked any direct indication of biotic activity. Although earthworms and termites were present at dondondwane, it appears that their activity did not substantially alter the archaeological stratigraphy of the site. The forces of down slope erosion and deposition of sediments on the more gently sloping terrain along the river valley bottom are more pronounced. Upslope, cultural deposits are very shallow (within 5 cm of the surface), while down slope they can be buried as deep as 1 m. However, earthworm and termite activity may differentially affect sites located in other southern African ecozones (*e.g.*, coastal littoral, highveld) that have experienced different natural and cultural taphonomic post-burial processes. Ultimately, we cannot assume that there are direct links between the patterning of artefact and feature distributions on Early Iron Age sites and human behaviour. Such linkages must be demonstrated on a case-by-case basis by considering the physical and biological processes that affect the movement and positioning of artefacts, ecofacts, and features within the three-dimensional context of a site.

CONCLUSIONS

Despite the relatively common occurrence of earthworms and termites at many archaeological sites throughout the world, the gap in archaeological literature on this subject indicates that the ecofacts resulting from their activity are often overlooked or otherwise considered of little analytical importance. In southern Africa, the systematic collection of artefacts and ecofacts has created an abundant material record that yields evidence of both human activities and environmental conditions at sites. Since ecofacts such as those discussed above are likely being recovered from other Early Iron Age sites, it is quite necessary that their presence and location be noted and their significance evaluated. In this paper, we have stressed that a detailed analysis of these objects provides a proxy record that can enhance our understanding of local ecological processes, archaeological site formation, and subsistence.

A new class of evidence that helps identify the presence of burrowing invertebrates on sites was presented. This has also led to the discovery for the first time of sorghum as a cultivated grain crop at the site of Ndondondwane. Botanical analyses of carbonised seed remains had not previously identified this important staple crop at this site. It is now known that both sorghum and bulrush millet (*Pennesitum typhoides*) were cultivated at Ndondondwane.

Termites and earthworms can be important agents of postburial modification of artefacts, ecofacts, and sediments. They destroy but they also can preserve evidence of cultural behaviour. Most research on the effects of burrowing activity at archaeological sites is cast as cautionary tales. The mixing and churning of soils by animals are often viewed as barriers impeding a "correct" interpretation of past cultural activity. In this article, we have instead demonstrated how the identification of indirect evidence of burrowing activity may also be instructive about the formation of archaeological deposits and preservation of Early Iron Age cultigens in

eastern South Africa. Issues surrounding site formation and intra-settlement organization continue to pose major problems for understanding the social and economic organization of early farming communities in southern Africa. We hope to have shown that alternative, indirect sources of evidence may also play an increasingly important role in resolving these issues.

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EARLY ROCK ART RECORDS IN THE COLLECTIONS OF THE PITT RIVERS MUSEUM, UNIVERSITY OF OXFORD

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ABSTRACT

This paper reviews the early rock art holdings of the Pitt Rivers Museum and their place in the history of rock art recording. The focus is on the Museum's small but interesting collection of photographs of rock art, dating back to 1894. The photographs and few copies are mostly provenanced and comment is made on the sites' current conditions. Those photographs that can not be provenanced are also included. The Museum's oldest and largest collection of records, made by Louis Tylor, is not covered. Although no attempts at interpretation are made, it is hoped that this paper will encourage others to study the Pitt Rivers Museum's holdings for themselves.

INTRODUCTION

The Pitt Rivers Museum cares for several late nineteenth and early twentieth century copies of southern African rock paintings (Table 1). In the course of researching these holdings the collections of tracings and photographs discussed here were examined; the most important and earliest comprise those made in 1893 by Louis Tylor in the Wasbank and Giants Castle areas of the KwaZulu-Natal Drakensberg. Though several holdings remain unprovenanced, we feel it important to place all of them on record and to comment briefly on those that are oldest and thus likely to be of greatest historical significance. Five pieces of painted stone detached from rock shelters in the Stormberg Mountains of the Eastern Cape by Edward J. Dunn (collected in 1877 and donated in 1936) will be considered in a future publication on the Dunn collection (see also Dunn 1931:112-114). The Pitt Rivers Museum also housed an important collection of copies of rock paintings made prior to 1906 by Helen Tongue. This collection was handed over to the Rock Art Research Unit (San Heritage Centre) of the University of the Witwatersrand in 1986.

Rock paintings and engravings occur throughout southern Africa. They began to be reported by European visitors in the eighteenth century (Morais 1984) and were first published in the early nineteenth century, for example by Alexander in 1837. This pre-empted more systematic recording in the latter half of the nineteenth century, with the efforts of Stow (1930) in the present Free State and Eastern Cape Province and of Hutchinson in KwaZulu-Natal (Ward & Maggs 1994) being particularly prominent. Subsequent decades witnessed more widespread efforts to document and preserve rock paintings and engravings in the face of what was already perceived to be their deterioration and loss through natural exfoliation, human vandalism and other causes (*e.g.* Wilman 1911).

THE COLLECTIONS

Marianhill photographs

Among the many ethnographic photographs in the Pitt Rivers Museum are several purchased in 1896 that bear the stamps and numbers of the Marianhill Mission in KwaZulu-Natal. Four of these photographs are of rock paintings. Vinnicombe (1976) records that such photographs were taken in the late nineteenth century by Brother Otto Mäder of the Trappist Mission at Reichanau in the Pholela Valley. His involvement in the restoration of religious paintings in Germany before coming to South Africa appears to have been the origin of Brother Otto's interest in Bushman art. Three of the four photographs held by the Museum are of images that he used to illustrate a paper that he later published on this subject (Otto 1908). Several painted slabs, detached from painted rock shelters are now held by the Marian-hill Mission and by the Feldkirch Teachers' College, Voralberg, Austria (Vinnicombe 1976).

Table 1. Early southern African rock art records in the Pitt Rivers Museum.

Political division	Collector / copyist	Year of collection	Accession number	Brief description of holding
South Africa				
KwaZulu-Natal	Louis Tylor (copyist)	1893	1894.15.8. 1-97	97 Copies of rock art from the KwaZulu-Natal Drakensberg
	Louis Tylor (collector)	1893	1894.15.1-6	6 pieces of painted stone from the KwaZulu-Natal Drakensberg
	Brother Otto Mäder (photographer)	1894	C2/3/.a	1 b/w photograph from Sangwana 1 (elephant hunt)
	Brother Otto Mäder	1895	C2/3/.c	1 b/w photograph from Sangwana 1 (cattle)
	Brother Otto Mäder	1894	C2/3/.d	1 b/w photograph from an unidentified site (two eland)
	Brother Otto Mäder	1895	C2/3/.b	1 b/w photograph from an unidentified site (horse and rider)
	Unknown photographer	Pre-1915	Box B 13, Dossier	1 b/w 'negative' photograph from Game Pass Shelter, Kamberg
Eastern Cape	E.J. Dunn	1877	1940.10.35.1,2 1940.10.36.1,2 1940.10.37	5 pieces of painted stone from the Stormberg
	Dr. Schönland (photographer)	Pre-1915	Box B 13, Dossier	3 b/w photographs from Glen Craig rock art site
	Unknown photographer	Pre-1915	Box B 13, Dossier	1 b/w photograph from Cold Springs station.
	Unknown photographer	Pre-1915	Box B 13, Dossier	1 b/w photograph from Sunnyside
Northern Province	Mr. Ormesby (photographer)	1912	Box B 13, Dossier	2 b/w photographs from Sand River, Soutpansberg.
Free State	Mr. Philipson (photographer)	1910	-----	3 b/w photographs of the rock art on the farm 'Vencedor' (see below)
	Mrs. E.F.B. Wilson (copyist)	1912	1912.25.1	Copy of rock art on the farm 'Vencedor' (now 'Badenkop')
	M. Wilman (copyist)	1916	1925.46.39, 40, 41	3 copies of rock art from Westbury
	Reproduction by H. Aling of a copy by M. Wilman	Pre 1913	1913.47.1	Cattle raid scene from Modderpoort.
Uncertain Provenance	Unknown photographer	Pre-1915	Box B 13, Dossier	1 b/w photograph from Leeuw river (unidentified site)
Lesotho	M. Wilman	1910-13	1913.47.2	Reproduction of a pair of blue cranes from Ha Baroana.
Zimbabwe	d.d. R. Tarrant	Pre-1915	Box B 13, Dossier	2 b/w photographs from Delta farm, Marondera
	d.d. Meynell	Pre-1915	Box B 13, Dossier	2 b/w photograph from the central Matopos, North of Mt. Impu
	Franklin White (photographer)	Pre-1915	Box B 13, Dossier	1 b/w photograph from near World's View, Matopo Hills

The first of Brother Otto's photographs in the Pitt Museum's collections (Fig. 1) is numbered 500 and dated 1895, this was published by Vinnicombe (1976: 117). The image depicts an elephant hunt with three human figures attacking an elephant, one human figure is carrying long spears and another may be firing a rifle, a white horse is depicted at the top right of the scene.

A second photograph (Fig. 2, numbered 353 and dated 1894) is of another scene described by Vinnicombe (1976:118). The photograph shows a human figure on the left of the frame behind a group of 13

Fig. 1. Rock paintings at Sangwana 1, KwaZulu-Natal.

cattle some of which are mottled, there are two eland towards the front of the cattle and a horse in the centre of the group, two further small horses are below and to the right of the cattle, there is also an unidentifiable four-legged animal below the cattle; all the animals are moving from left to right. To the right facing the oncoming animals is a standing human figure, this may be a European, wearing trousers and carrying a rifle.

Both photographs (Figs. 1 & 2) are of Sangwana 1 (2929CD15) in the Underberg District of KwaZulu-Natal. The paintings from this site were copied by Betty Mills in 1954 (Vinnicombe 1976); however, it is not clear whether the absence from the copies of several elements that are depicted in the photographs reflects the standard of the copyist or deterioration in the paintings during the intervening sixty years.

A third photograph (Fig. 3, numbered 502, dated 1895) depicts a human figure on a horse. Only dark colours are visible and the horse is darker than the rider who is not at all clear. The horse is shown with tail down next to its back legs, head down, neck curved and front legs bent slightly as if rearing. The site remains unidentified, however, V. Ward (pers. comm.) suggests that its overall style is suggestive of the southern KwaZulu-Natal Drakensberg.

The fourth and last of the Marianhill photographs at the Museum (Fig. 4) is numbered 364 and dated 1894. The main elements are two eland, one above the other, of which the uppermost is slightly larger. Both face right and have white heads, necks, legs and underbellies, but with darker faces, bodies and horns. The upper animal also has four vertical lines on its neck. Once again, the site at which this photograph was taken remains unknown. There is another figure painted within a pale area of rock where a flake has come off. This is reminiscent of those at Melikane (Orpen 1874), Libesoaneng (Smits 1973) and Bamboo Mountain (Vinnicombe 1976) as it seems to be a therianthrope bending forward at the waist and supporting its weight on two sticks.

Box 13 photographs

Box Number 13 in the Museum's archives includes a dossier labelled 'Bushman paintings'. Inside are 14 photographs, drawings, press cuttings and two letters from R.N. Hall to Henry Balfour, the Museum's first Curator. All seem to have been gathered together by Balfour over a number of years. Nine photographs from a total of six sites come from South Africa, while five Zimbabwean photographs come from three, perhaps four, separate locations. All were acquired prior to 1915. Some of the photographs from Zimbabwe may have been forwarded by Hall to Balfour, although there is no direct documentation of this in the Museum's archives. Having 'excavated' (if that is the right term) at Great Zimbabwe, Hall (1912) developed an interest in

Fig. 2. Rock paintings at Sangwana 1, KwaZulu-Natal .

Fig. 3. Rock painting at unidentified site, KwaZulu-Natal.

Fig. 4. Rock paintings at unidentified site, KwaZulu-Natal.

Fig. 5. Rock painting at Botha's River, Glen Craig, Eastern Cape Province.

Zimbabwe's rock paintings and claimed to have recorded more than 300 sites, though Peter Garlake (1997) dismisses most of his observations as unscholarly and derivative. Both of his letters to Balfour invite comment on his publications on rock art, examples of which from the *Rhodesia Journal* were enclosed with them. The first letter, dated December 9th 1909, also makes reference to the enclosure of 'reproductions' of several paintings, but no trace of these has been found in the Pitt Rivers Museum's archives.

Three, perhaps four, of the South African sites represented in Box 13 lie in the Eastern Cape Province near Grahamstown. A set of three photographs comes from Botha's River, Glen Craig. The first photograph shows three rows of images, two on an upper step of rock face directly above the third row. The top row consists solely of a single kneeling antelope facing right. The second row consists, from left to right, of two antelope moving right, two standing human figures holding stick-like objects, and a third human figure running right carrying a bow. The third row consists of one or possibly two antelope facing right, and further to the right, a single human figure holding a long stick-like object. The second photograph contains six human figures arranged in three groups. The first group is in the top left of the frame, and consists of two figures both carrying stick-like objects, the figure on the left is facing right whilst the other figure is not clear; the second group, directly below the first, has three figures all carrying what may be flywhisks; to the left of the figures is a smaller and less clear figure. To the right of the previous two groups is the third and final group consisting of a solitary figure facing left and carrying an indeterminate object, or objects, in one hand. The third photograph (Fig. 5) shows a clearly male human figure striding to the left and holding what may be a recurved bow in his right hand and a vertical stick in his left. A group of four lines (arrows?) emerges from close to the man's right wrist and four further lines (arrows?)

Fig. 6. Rock paintings at Cold Springs Station, Eastern Cape Province.

Fig. 7. Rock paintings at Game Pass Shelter, KwaZulu-Natal.

Fig. 8. Rock paintings from Sand River, Northern Province.

project over his right shoulder. This site was visited by Hewitt in the 1920s, excavations were later carried out by Courtney-Latimer in 1948, and it has been subsequently visited by several archaeologists. L. Webley (pers. comm.) has recently documented the presence of numerous graffiti covering the rock face and a more final threat posed by nearby dam construction. Albany museum does not know of any older records of the Glen Craig rock art.

Of the photographs of other Eastern Cape sites, the first from a site named by Balfour as 'Cold Springs Station', this is taken from a distance; in the middle of the rock face is an image showing a woman with a digging stick, and possibly another human figure, although this is not clear. To the lower right are several baboon/human-like figures on all fours, and higher on the rock face many short vertical strokes. The site's location is currently unknown despite efforts to relocate the site in May 2000. It is possible that the site has been misnamed in the dossier as another site known as 'Paradise', and recorded as such by Hewitt in 1920, does fit directions to 'Cold Springs' given by Balfour in his diary. A second photograph (Fig. 6), depicts several elongated human figures, one of whom is bent at the waist to the left in the clear group on the upper right. One or more figures on the left of the frame may be graffiti. The photograph is from a site on the farm Sunnyside near Salem. Though recorded on more than one occasion since and still, in the 1990s, in good condition, this photograph too is probably the oldest documentation available for this site.

A fourth site, Leeuw River, is represented by a single photograph showing two human figures moving right, carrying something between them on their shoulders suspended from what appears to be a stick. Unfortunately, the provenance of this painting is not given and no further information is available about it.

Box 13 also contains a single negative reproduction (Fig. 7) of a panel of eland and cloaked and running figures from the well-known site of Game Pass Shelter in the KwaZulu-Natal Drakensberg. Wrongly identified in the dossier as lying in 'Basutoland', and printed back to front, this is among the oldest records for this important and now publicly accessible site (Lewis-Williams & Dowson 1992).

The final group of photographs from South Africa in Box 13 were taken by a Mr Ormesby in 1912, and come from Zand River Poort (*sic*) in the Soutpansberg, Northern Province. One (Fig. 8), shows two male individuals with bows, one of which has the string drawn back; this individual also has six short lines through his stomach and back, perhaps representing the pain reputedly felt by people about to go into trance (Lewis-Williams & Dowson 1989). A second photograph (Fig. 9) illustrates seven probable kudu in a line moving right, with a male human figure running right situated below and to the left. This figure is carrying a bow in one outstretched hand and several other objects in the other. Below the human figure is an unidentifiable four-legged animal. Both photographs were passed to the Pitt Rivers Museum by a Mr Glaske of the Transvaal Education Department, Pretoria, who had met Balfour during the latter's visit to South Africa in 1910. Though damaged by graffiti, this site has been well recorded and has Eiland ceramics on its surface, suggesting contact between local hunter-gatherers and farmers (W. Fish, pers. comm.).

Box 13 also includes five photographs of rock art sites in Zimbabwe. Two come from Delta Farm, Marondera. One (Fig. 10) shows what appear to be five zebra, an antelope and an elephant superimposed, in darker paint, on at least 6 faded images of people; all are moving from left to right. The animals are in four rows with two zebra in the top row, three zebra in the second, two antelope in the third, and an elephant in the last row. Behind the elephant is a human figure, in a darker paint, similar to that used for the animals. Above the animals is a single seated human figure bent forward at the waist facing right. The other photograph (Fig. 11) illustrates a single large elephant moving from right. Both were given by Mr Robert Tarrant, the owner of the farm, to a family friend, Mr Dowson of the Lion Brewery, Oxford, who then gave them to Henry Balfour. From surviving correspondence we know that the photos were taken in 1914.

Two further photographs (Figs. 12 & 13) were donated by R. Mennell in 1908. Mennell was among the first to report stone artefacts from the Matopo Hills, and in 1908 collaborated with E. Chubb to photograph the paintings at the well-known site of Silozwane (Mennell & Chubb 1908). The two photographs are provenanced

Fig. 9. Rock paintings from Sand River, Northern Province.

only to 'central Matopos north of Mt Impu', but, pending confirmation in the field, it seems likely that they may represent some of the images at Silozwane.

They illustrate adjacent and conjoining areas of the rock face and show a complex scene, the most prominent feature of which is an animal-headed snake moving to the right and placed directly above a horizontal crack in the rock-face. On the back of the snake are at least 22 figures, all but one moving left to right. Of these figures at least two are clearly baboons whereas the rest are human, although in a variety of postures, including standing and on all fours.

The most prominent of the figures are the five nearest the head of the snake, one of whom is bending forward and down towards the ground. The tail of the snake is not unlike that of a scorpion. Below the crack in the rock are at least 40 human figures, the majority organised in a line. Two of these figures are extremely elongated and their necks appear to disappear into the crack. Below the snake's neck and to the upper right of these last human figures is a small group of three antelope and several other human figures. To the left of the snake's tail (Fig. 13) is another complex scene principally consisting of elongated human figures, many of which have no visible head.

Two of these figures appear to be superimposed on a giraffe and an antelope respectively; both animals are moving from right to left. Most of these figures appear to be standing still, but some are striding. Above this complex of figures, to the left of the snake's tail, is a single small lying antelope, with its head turned to the right. Some way below all these painted images on Fig. 3, and perhaps on the far right of Fig. 12 are some grid-like patterns.

The final photograph in Box 13 comes from a site near World's View in the Matopos and was donated by Franklin White before 1915. It shows a number of people and two antelope and may come from the World's View rock-shelter that White (1905) excavated at the beginning of the twentieth century. Finds from this and another site excavated by White in the Matopos are now housed in the British Museum (Mitchell in press).

Vencedor/Badenkop

As mentioned above, in 1910 Henry Balfour, then Curator of the Museum, made one of several visits to South Africa. Between lecture stops he took the opportunity to visit several archaeological sites. One such stop was at Harrismith, Free State, where he lectured on August 15th. In his diary Balfour records visiting a nearby rock art site, of which he also made a sketch, in the company of Dr E.F.B. Wilson:

> Drove out to Wessels farm, to part occupied by Mr Philipson, to see a good Bushman rock-shelter,

Fig. 10. Rock paintings at Delta Farm, Marondera.

Fig. 11. Rock painting at Delta Farm, Marondera.

> with some very fine paintings, eland and other buck, many human figures some with animal heads etc. The paintings very numerous, partly defaced, some in two or three colours, others monochrome (red), cases of superposed (*sic*) designs. Mr Philipson promised to take photographs & send them to me. The rock shelter is about 4 miles from Harrismith & stands a little away from the base of a high rock Kopje (Balfour 1910).

Among Balfour's lecture slides were discovered a letter from Mr Philipson dated August 18th 1910 and three black-and-white photographs, taken by Philipson, of the site and the art (Fig. 14). This information allows us to makes sense of a rock art copy in the Museum's collections. Made by a Mrs E.F.B. Wilson, this copy was donated in 1912 and is provenanced to the farm 'Vencedor', now known as Badenkop. It shows four eland and eight human figures copied in pencil and then coloured on a piece of paper approximately 1130 mm x 450 mm. The images are not placed in relation to their position on the rock face, but are placed so as to fit on the paper in two rows.

Working from left to right, the top row of images consists of a large eland facing right, a standing Headless human figure facing right, a standing elongated human figure with arms outstretched in front facing left, and a human figure running to the left. The second row consists of a group of five standing figures facing right, two are wearing pointed headdresses, and two are carrying stick-like objects in front of them. To the right of the people is an eland painted at an upward angle facing right. In the centre of the row is the most striking of the images, a rear-end view of an eland with its head and neck stretched up and right at a 45° angle. The last image is a large eland with its head down facing right. Confusingly, the striking rear-end view of the eland in the middle of the scene is provenanced by Lee & Woodhouse (1974:25) to a site elsewhere in the Harrismith District, but there seems little doubt that Mrs Wilson's copy does come from Badenkop as the Wessels farm to which Balfour refers is probably the modern farm Wesselshoek, only 5 km distant from Badenkop.

Westbury

The Museum also holds five copies of rock art made by Maria Wilman, including early reproductions of a pair of blue cranes from the well known site of Ha Baroana in western Lesotho and of a cattle raid from

Fig. 12. Rock paintings from the 'central Matopos'.

Fig. 13. Rock paintings from the 'central Matopos'.

Fig. 14. Rock paintings from Vencedor/Badenkop, Free State.

Modderpoort, Free State. The other three copies, however, appear to be original and come from the site of Westbury near Clocolan, eastern Free State. Westbury is a small shelter, excavated by Thorp (1997), at which the paintings are still in good condition. Woodhouse (1988) published a group of eland from this site, believing it to be the first record of paintings from there. The existence of the Wilman copies shows that this was, in fact, not the case. All three copies are labelled 'Waterfall' and dated 1916. They consist of: a standing female figure facing left and holding a stick above her head (PRM 1925.46.39); a standing female figure facing right with one arm out in front, bent at the elbow to form a 'V' (PRM 1925.46.40); and a group of eland with 11 heads emerging from a crowd of undefined eland bodies (PRM 1925:46.41).

Louis Tylor Collection

This collection is too extensive to cover in this publication, however, Ward and Maggs (1994) detail the current state of the original paintings, and a forthcoming biographical publication on Louis Tylor himself provides some further information.

DISCUSSION

Though few in number, the fact that all of the photographs and copies we have discussed here were acquired by the Pitt Rivers Museum before 1916 in itself makes them of historical interest as being among some of the earliest such records of southern African rock art. Today, more than ever before, southern African archaeologists and conservation bodies struggle to strike a balance between the need to record and protect rock art while simultaneously encouraging responsible public interest in it and access to it. Early records such as those we have described here, along with the drawings made by Tylor in the KwaZulu-Natal Drakensberg in 1893, can be used in this effort by providing a baseline against which to measure deterioration in the condition of rock-paintings over the past century (Ward & Maggs 1994). As one of the few institutions in Britain to hold copies of southern African rock art among its collections, we hope that interested researchers will now contact the Museum and make use of the material presented here.

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LATER STONE AGE OPEN-AIR SITES ON BLOUBOS, NORTHERN CAPE

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ABSTRACT

A large Later Stone Age open-air, surface site north of Upington was sampled to investigate what evidence such sites can provide about the original occupants. The analysis suggests that it was intermittently frequented over an extended period by groups of herders who usually lived along the Orange River and who exploited the local resources when surface water was available after rains. The results emphasize the potential value of such open-air sites for documenting subsistence strategies in the wider southern Kalahari desert.

INTRODUCTION

The archaeological value of surface assemblages has long been underestimated by workers in the field, and mainly restricted to their use in locating stratified, subsurface sites. The potential and expanding role of surface assemblages has, however, been emphasized by Lewarch and O'Brien (1981). Formation process research has proven that few artefacts, whether they are retrieved from the surface or subsurface, are found *in situ*. Neither surface scatters nor deposits are strictly speaking "'fossilized' records of the past", since all material remains "enter the archaeological context as surficial exposures" (Lewarch & O'Brien 1981:312).

Sporadic mention of surface scatters on sand dunes in the vicinity of Upington in the Northern Cape has been made in the past (Rudner 1953; Rudner & Rudner 1959; Clark 1959; Sampson 1972; 1974). Sampson (1972:262) made specific mention of surface scatters in Namibia, Botswana and around Upington containing high proportions of backed blades, endscrapers and segments with associated pottery. Clark (1959) recorded similar stone tool types and grouped them under the SWA or Kalahari Wilton variant. In 1959 I. and J. Rudner referred to thin-walled Khoisan pottery found at sites near Upington. More recently Smith (1995:265) commented on the emerging importance of surface sites and recommended the survey and collection of surface scatters in the area, as was done by Sampson in the Seacow River valley. He also briefly discusses a number of sites in the area, such as Droëgrond (Smith 1995).

In early historical times the riverine area was a hunter-herder contact zone (Penn 1995). Both Beaumont (Beaumont *et al.* 1995) and Smith (1995) differentiate between hunter and herder sites in the Northern Cape. A closer investigation of surface scatters may, therefore, contribute to our understanding of the subsistence strategies of these hunters and herders in the region and ultimately reveal their utilisation of the resources of the landscape. The surface site BB5 was chosen as focus for a project concerned with the distintion between the two types of sites.

THE SITES

As shown in Figure 1, the farm Bloubos is located between the Orange and the Kuruman Rivers. To the west the area is bound by the derelict southward stretch of the Molopo River, and to the east by the Langeberg and Korannaberg. The farm lies within 100 km north-north-west of Upington in the southernmost part of the Kalahari desert. North of the Orange River there are no permanent water sources, but after local showers the numerous pans in the landscape may carry water for a while.

Site Bloubos 5

Bloubos site BB5 (28.08S 20.48E), is a surface scatter lying on the lower slope of a linear dune adjacent to a sizeable pan. The surface scatter that consists of a substantial number of utilised stone artefacts, formal tools, grinding tools, cores and waste material, was chosen because of its size and its apparent undisturbed nature. A grid consisting of ninety six 5 x 5 m squares was placed over the scatter and all the archaeological material from eighteen randomly chosen blocks was collected for typological and metric analysis.

Site Bloubos 7

Bloubos site BB7 (28.04S 20.51E) lies some 10 km from BB5 on the northern portion of the farm in quite a

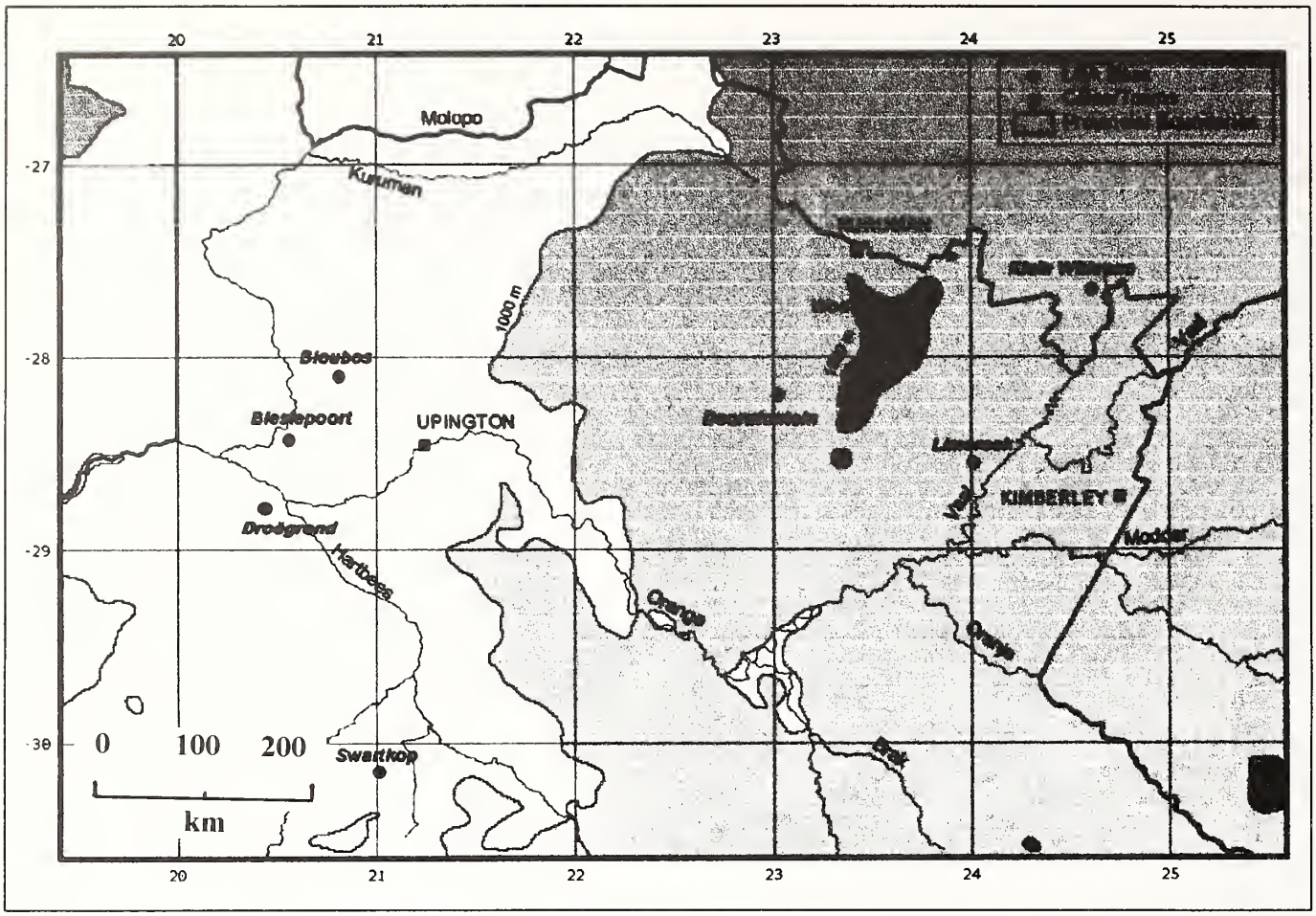

Fig. 1. Topographic map of the study area indicating the locations of Bloubos, Biesiepoort 2 and Swartkop 1. Other contemporaneous sites are also indicated (southern latitudes, eastern longitudes).

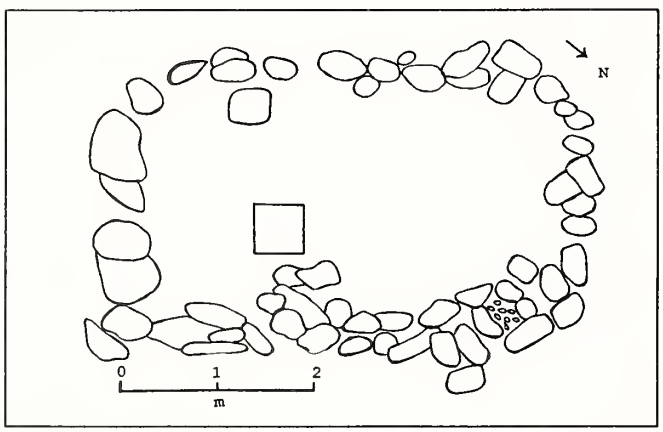

Fig. 2. Survey plan of site BB7. The position of the 0,5 m x 0,5 m test pit is indicated within the stone circle.

different environmental setting. The surface is rocky without a sand dune or pan nearby. The site, situated among boulders, comprises a definite stone circle enclosing a sandy accumulation (Fig. 2). BB7 was excavated primarily to determine how far its artefacts differ from those found at BB5 by means of typological and metric comparison. Since the intention was not the large-scale accumulation of material, only a 0,5 x 0,5 m test pit was excavated at a randomly chosen position within the circle. It was excavated in 50 mm spits down to 350 mm and in 100 mm spits down to 750 mm depth. The compaction of the reddish grey coloured deposit was medium to loose. Spits 1 to 6 were ashy whereas the surface and lower spits were of a more sandy nature. No clear stratigraphy was discerned. Utilised stone artefacts, formal stone tools, cores, waste material, decorated and undecorated ostrich eggshell (OES) fragments, OES beads, bone fragments and some ceramic and charcoal fragments were found, but there were no manuports or anvil or grinding stones.

RADIOCARBON DATES

Radiocarbon dating was performed by J.C. Vogel on OES samples from the Bloubos sites. As previously indicated by Horowitz *et al.* (1978), such OES dates need considerable adjustment. A recent evaluation of the radiocarbon ages produced on OES has revealed that the reason for this is twofold (Vogel *et al.* in press). Firstly, ostrich eggshell tends to survive for long periods in the environment and can easily be incorporated into later deposits in the same way as pebbles are. Shell from an excavated level or from a surface scatter can thus be a mixture of fragments of different ages. The result is that a date is obtained that is older than the actual age of the stone assemblage that is to be dated. Secondly, it was found that ostriches incorporate 'dead' carbonate into the shell, causing the radiocarbon age to appear, on average, 180 years too old. Dates produced with this material must therefore be adjusted by the subtraction of

180 years. The uncertainty coupled with this effect also increases the error of the dating.

Since all the Bloubos dates were obtained from OES fragments, they have to be corrected for the 180 year offset. The Pretoria Calibration Program (Talma & Vogel 1993) was used to convert the 180-year corrected dates to the historical time-scale. The data used in the present version of the program is the recently revised results for the northern hemisphere as published by Stuiver *et al.* (1998), but adjusted to account for the southern hemisphere offset and to best match the Pretoria equipment (Vogel 2000:52). The calibrated dates for the Bloubos sites are as follows:

Analysis	Site	Apparent age	Calibrated date
Pta-7381	BB5, surface	1810 ± 45 BP	Ad 416(438)536
Pta-7730	BB7, spit 2	340 ± 50 BP	>AD 1676
Pta-7755	BB7, spit6	2370 ± 45 BP	345-313, 210(186)146 BC

The Bloubos sites were obviously intermittently occupied over a considerable period of time which ended before the European influx since no artefacts of European origin were retrieved from either BB5 or BB7.

TYPOLOGICAL ANALYSIS OF ARTEFACTS

The classification scheme for artefacts used in this study consists of five classes namely flakes, cores, formal tools, manuports and waste material. The flake class is divided into complete and broken flakes, with the former subclassed into blades, points, and irregular flakes. Blades are those flakes with a length of at least twice the breadth and with parallel sides. However, a flake with a length twice that of the breadth, but with a thickness equalling the breadth, is not classed as a blade. Broken flakes are blade flakes with either the proximal or distal end, or both ends, snapped off. Utilised flakes are those with damage visible to the naked eye along the working edge of the artefact. Unutilised flakes are classed as waste material.

Artefacts belonging to the core class have three or more negative flaking scars as defined by Deacon (1984a:371). Cores are subdivided into irregular cores and blade cores, the latter either being conical or flat.

The formal tool class includes lithic artefacts with secondary retouch. This class is subdivided into scrapers, segments, backed blades and points. The scraper class is subdivided into sidescrapers, endscrapers, side- and endscrapers, double side- or endscrapers, round scrapers and concave scrapers. No distinction was made between scrapers and adzes in this study. Adzes have been defined as being made on flakes or pebbles, having one or more straight or concave working edge, and as generally being larger than scrapers (Deacon 1984a:391). They are also said to be similar to hafted Australian woodworking tools (Clark 1959:233-234). Clark (1959:201) however, does not distinguish between the functions of scrapers and adzes. It furthermore seems that the shape of adzes is dependent on the extent of use, and may "vary significantly" (Humphreys & Thackeray 1983:304).

Manuports refer to unutilised material brought to a site for tool manufacture. Waste material refers to the unretouched and unutilised byproducts which result from tool manufacture (Deacon 1984a:370). Other lithic remains include upper grinding stones, hammer stones and anvil stones. In other words, all unflaked, utilised lithics.

BB5 artefacts

A complete list of the artefacts retrieved from BB5 is given in the lithic inventory in Table 1 and a selection of formal stone tool types are illustrated in Figure 3. In total 10878 lithic pieces were collected from BB5. 51% of this total is classified as utilised stone artefacts (cores included), 38% as waste material, and 11% as manuports. The amount of waste material present at BB5 is small (Deacon & Deacon 1999:112-113). For the purpose of this study, only utilised and retouched stone artefacts and cores were taken into account to determine relative frequencies. Figure 4 provides a breakdown of these classes from, among others, the Bloubos sites. As indicated in Figure 4, the majority of utilised flakes in the assemblage are irregular although blade flakes are well represented. An interesting feature of the broken flakes is that the distal ends are more numerous than either the proximal or medial parts. One would expect a roughly equal number of proximal and distal sections and somewhat less medial pieces. It is noteworthy that 154 (65,8%) of BB5 scrapers were manufactured on the proximal ends of broken flakes. This figure accounts for the deficiency of proximal ends of flakes and it is thus postulated that broken flakes with bulbs of percussion were selected for the manufacture of scrapers.

In total the utilised artefacts which include irregular flakes, blade flakes and broken flakes represent the largest portion of the artefact assemblage by far (85,1%). Irregular cores are more numerous than blade cores (Fig. 5). This occurrence correlates with the proportion of irregular to blade flakes.

The 332 formal tools from BB5 represent a substantial 6,0% of the stone tool assemblage. As shown in Figure 6, the class is dominated by scrapers although all the other subclasses are represented. The majority of scrapers are endscrapers which represent some 50% of the formal tool class. The scrapers differ from one another with regard to angle of retouch.

Backed blades represent 25% of the formal assemblage while only two points were found. These points had clear retouch on converging sides. Blades that end in a point but have mainly parallel sides and/or lack of

Table 1. Inventory of stone artefacts from site BB5.

SQUARE	D2	E6	F3	F4	H2	H3	H4	H5	H6	I1	I2	I3	I4	I5	I6	J1	J4	J6	BB5	FREQUENCY	
ARTEFACT TYPE																				%	%
UTILISED FLAKES	27	219	177	185	634	469	353	332	145	141	371	355	355	246	118	20	267	314	4728		85.1
COMPLETE FLAKES	23	178	149	163	569	346	287	262	110	120	302	270	293	211	112	15	213	252	3875	69.8	
Irregulars	21	110	107	112	372	250	208	178	85	86	208	187	220	178	95	9	168	184	2778	50.0	
Blades	2	68	42	51	197	96	79	84	25	34	94	83	73	33	17	6	45	68	1097	19.7	
BROKEN FLAKES	4	41	28	22	65	123	66	70	35	21	69	85	62	35	6	5	54	62	853	15.4	
Proximal	3	20	8	8	22	27	9	20	9	5	5	16	15	7	2	2	10	16	204	3.7	
Medial		12	6	8	16	10	12	17	6	7	26	20	17	9	1	3	14	18	202	3.6	
Distal	1	9	14	6	27	86	45	33	20	9	38	49	30	19	3		30	28	447	8.0	
FORMAL TOOLS	1	14	11	26	46	45	30	23	7	2	20	23	29	8	3	5	14	25	332		6.0
SCRAPERS	1	9	6	15	36	29	25	22	6	2	15	11	24	8	3	3	9	10	234	4.2	
Endscrapers			2	1	24	25	25	22	4	2	12	9	18	5	2		6	8	165	3.0	
Side- and endscrapers		9	4	8	3				2							2			28	0.5	
Sidescrapers					9	3					3		6	3					24	0.4	
Dbl sidescrapers												1			1		2	1	5	0.1	
Dbl endscrapers						1						1							2	0.0	
Round scrapers				4												1	1	1	7	0.1	
Concave scrapers	1			2															3	0.1	
BACKED PIECES		5	5	11	10	16	5	1	1		5	12	5			2	5	15	98	1.8	
Backed blades		5	5	9	9	15	5		1		3	8	5			1	4	13	83	1.5	
Segments				2	1	1					2	4					1	2	13	0.2	
Points								1								1			2	0.0	
CORES	3	9	10	15	41	57	43	57	16	14	20	27	44	30	29	2	28	34	479		8.6
Irregular cores	2	9	8	14	34	42	40	55	16	13	14	21	39	22	26	2	26	26	409	7.4	
Blade cores	1		2	1	7	15	3	2		1	6	6	5	8	3		2	8	70	1.3	
OTHER	1	1		3	1	2		2		1	1	1	1					2	16		0.3
Hammer stones		1			1													1	3	0.1	
Upper grinding stones	1			3		2					1		1					1	9	0.2	
Anvil stones								2		1		1							4	0.1	
TOTAL	32	243	198	229	722	573	426	414	168	158	412	406	429	284	150	27	309	375	5555		100
WASTE MATERIAL			37		309	277	410	474	132	135	513	484	404	244	84		282	306	4091		
MANUPORTS			38		211	115	75	117	75	46	80	103	153	55	24		82	58	1232		
GRAND TOTAL	32	243	273	229	1242	965	911	1005	375	339	1005	993	986	583	258	27	673	739	10878		

Table 2. Inventory of stone artefacts from site BB7.

SPIT	1 to 5	6 to 11	BB7	FREQUENCY	
ARTEFACT TYPE				%	%
UTILISED FLAKES	292	162	454		94.0
COMPLRTE FLAKES	210	129	339	70.2	
Irregulars	155	87	242	50.1	
Blades	55	42	97	20.1	
BROKEN FLAKES	82	33	115	23.8	
Proximal	32	9	41	8.5	
Medial	17	11	28	5.8	
Distal	33	13	46	9.5	*
FORMAL TOOLS	8	5	13		2.7
SCRAPERS	3		3	0.6	
Side and endscrapers	1		1	0.2	
Sidescrapers	2		2	0.4	
BACKED PIECES	5	5	10	2.1	
Backed blades	4	3	7	1.4	
Segments		2	2	0.4	
Points	1		1	0.2	*
CORES	13	3	16		3.3
Irregular cores	13	2	15	3.1	
Blade cores		1	1	0.2	*
TOTAL	313	170	483		100
WASTE MATERIAL	125	57	182		
GRAND TOTAL	438	227	665		

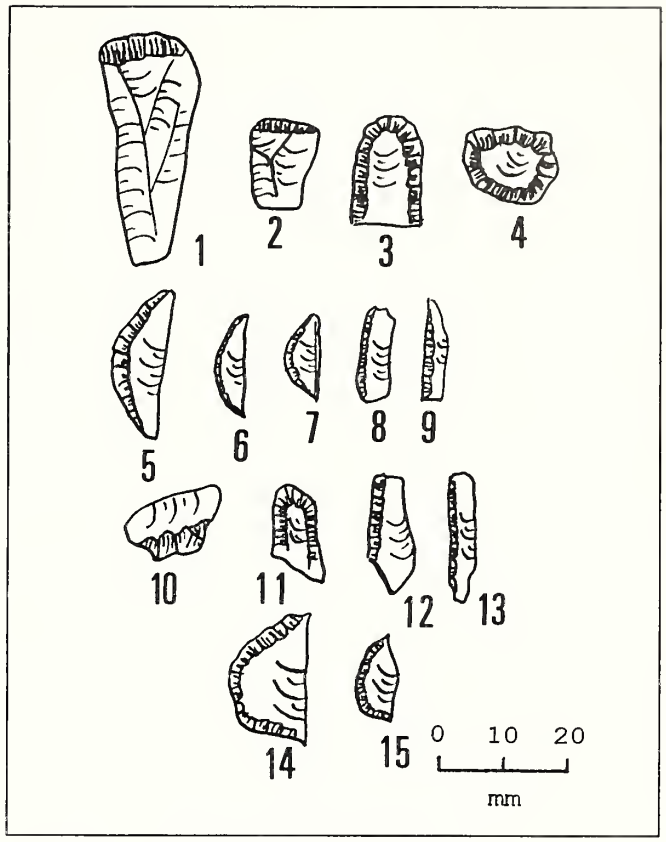

Fig. 3. Selected formal stone tool types from BB5 and BB7. 1-4: scrapers (BB5); 5-7: segments (BB5); 8-9: backed blades (BB5); 10-11: scrapers (BB7); 12-13: backed blades (BB7); 14-15: segments (BB7).

retouch on both sides were not classed as points. The backing on blades may sometimes end near the middle of the flake. The extremely delicate and finely made segments from BB5 represent 3,9% of the formal tool assemblage.

Other stone tools found at BB5 include anvil stones, hammer stones and upper and lower grinding stones. The four anvil stones have indentations on one or both sides indicating utilisation. Only three hammer stones were recorded. These stones fit easily into the hand and have utilisation damage on one or both ends. The presence of hammer and anvil stones along with waste material and manuports indicates that stone tools were manufactured on the site. Upper and lower grinding stones point to food preparation on site BB5.

Only a small ceramic sample, possibly the result of casual collection in the past, was retrieved from BB5. Fragments of thickened bases, lugs and decorated rim sherds, now unfortunately out of context, have in the past been collected on Bloubos. The twelve potsherds from the site have a light reddish brown colour, fine texture and grit temper. All the sherds are slightly burnt. These sherds do not seem to belong to a single vessel. Their average thickness of 5,6 mm and general appearance place them in the range of Khoi pottery (Rudner 1979; Beaumont, Smith & Vogel 1995:255).

BB7 artefacts

An inventory of the artefacts recovered from BB7 is given in Table 2 and examples of formal stone tools illustrated in Figure 3. The artefacts from the different spits are homogeneous and are for that reason discussed as a single unit. Interestingly, the test pit produced a

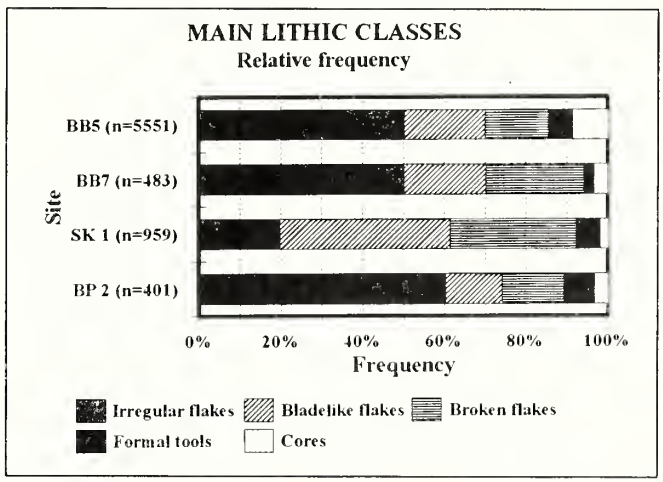

Fig. 4. Relative frequencies of the main lithic classes of sites BB5, BB7, Biesiepoort 2 (BP2) and Swartkop 1 (SK1) show little difference between the samples with the exception of the large number of bladelike flakes retrieved from Swartkop.

lower percentage of waste material than BB5 (27% compared to 38%), and no manuports.

The distribution of the 483 utilised artefacts between and within the main artefact classes is compared with the values for BB5 and other relevant sites in Figures 4 to 6. The frequencies of the irregular and blade flakes are virtually identical to those of BB5, while there are

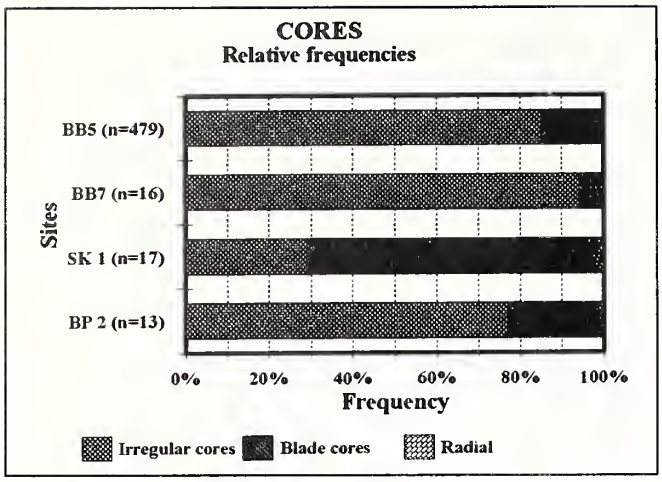

Fig. 5. Relative frequencies of the core classes of sites BB5, BB7, Biesiepoort 2 (BP2) and Swartkop 1 (SK1). The number of blade cores in the Swartkop sample corresponds to the large dicated in Fig.5.

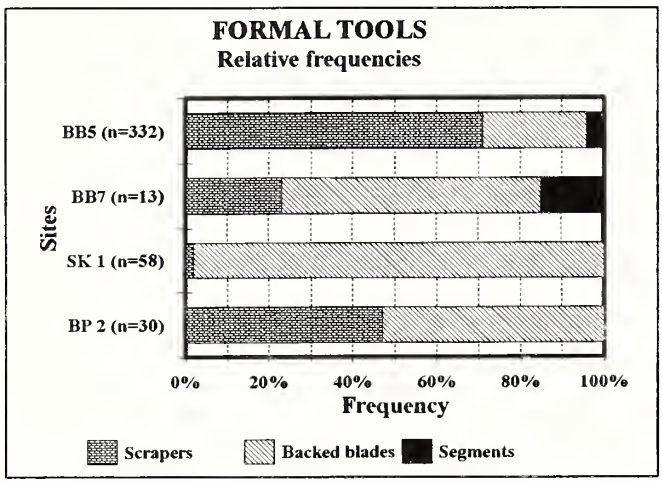

Fig. 6. Relative frequencies of the formal tool classes of sites BB5, BB7, Biesiepoort 2 (BP2) and Swartkop 1 (SK1). The breakdown of the formal component of BB7 shows that the same tool types as at BB5 are present. The Swartkop sample clearly belongs to a different industry while Biesiepoort is more similar to BB5 in terms of the division between scrapers and backed pieces.

relatively more broken flakes and less formal tools (only three scrapers) and cores. Furthermore, there is an almost equal number of proximal and distal ends in the broken flake class.

The small number of formal tools (thirteen) from BB7 makes any comparison of the frequencies within this category with BB5 meaningless. It suffices to mention that all three retouched types, scrapers, backed blades and segments, are present. Spits 8 to 11 contained no formal tools.

Several potsherds were recovered from BB7. Fourteen sherds picked up from the surface probably belonged to a single vessel since they all possess a similar rough texture, reddish brown colour and thickness, and are all slightly burnt. Spits1 to 5 contained nine potsherds. These differ somewhat in colour but they all have grit temper and a fine texture. A single rim sherd was found. No potsherds were excavated from spits 6 to 11. Since spit 6 (dated to 2370 ± 45) predates or coincides with the advent of pottery in the Northern Cape, this is to be expected (Beaumont & Vogel 1984: 91). The average thickness of the sherds retrieved from BB7 is 6 mm while the potsherds collected from the surface have an average thickness of 10,4 mm. Based on average thickness, the thicker sherds probably represent ceramics of more recent origin, while the excavated thinner ones clearly belong to the Khoi ceramic tradition (Rudner 1979; Deacon 1984b:273-274).

Three ostrich eggshell beads were found in spits 3 and 6 while four decorated OES fragments came from spits 2 and 4. The fragments are decorated with diagonal and cross-hatched incisions.

There are some differences in artefact frequency between sites BB5 and BB7. BB7 is characterised by relatively less cores and waste material than BB5. Furthermore, no manuports, anvil or hammer stones were retrieved from BB7. Since the two sites evidently belong to the same industry, this may be due to sampling error, but it may also be attributed to differing site functions. As the BB5 sample includes several anvil, hammer and grinding stones as well as cores and waste material, it is possible that this was a manufacturing site. On the other hand, the stone circle at BB7 may be interpreted as a habitation site.

METRIC ANALYSIS OF ARTEFACTS

Two different methods for measuring artefacts were used in this study. Firstly, artefacts were directly sorted into a set of shape and size classes and then the lengths and breadths of each individual artefact was measured and the means calculated so that the two techniques could be compared. The length was taken as the longest measurement from the striking platform to the opposite end of the stone artefact. Breadth was taken as the longest measurement at right angles to this. When no striking platform or bulb of percussion was visible, the longest dimension of the flake was taken as the length. Using a logarithmic scale, the size classes as defined by Vogel (unpublished) are: *lxb*: class 0,5 (<50 mm²), class 1 (50-100 mm²), class 2 (100-200 mm²), class 4 (200-400 mm²), class 8 (400-800 mm²), class 16 (800-600 mm²), *etc.* For the length/breadth ratios the appropriate logarithmic subdivision is taken as: *l/b*: class A (1-1.4), class B (1.4-2), class C (2-2.8), class D (2.8-4), *etc.* The dimensions of the classes are chosen to be just clearly distinguishable from each other.

The term 'microlithic' is used to describe stone tools which measure less than 200 mm² with a 'microlithic index' defined as the percentage of artefacts measuring less than that. Similarly, the 'blade index' is defined as the percentage of stone tools with a length greater than twice the breadth, *i.e. l/b* >2.

BB5 artefacts

As may be seen in Table 3, the stone artefacts from BB5 have a wide range of sizes and shapes. Using the

Table 3. Size and shape of the stone artifacts from site BB5.

SIZE mm²/100	Irregular flakes	Blade flakes	Broken flakes	Scrapers	Backed blades	Segments	Irregular cores	Blade cores	Total	Frequency %
0.5	59	76	67	5	13	0	0	0	220	4.0
1	249	186	245	12	29	9	0	0	730	13.2
2	490	266	316	74	29	3	0	2	1180	21.3
4	646	322	186	94	14	1	13	7	1283	23.1
8	581	172	35	33	0	0	65	29	915	16.5
16	424	50	3	7	0	0	97	17	598	10.8
32	252	21	1	5	0	0	131	8	418	7.5
64	86	4	0	4	0	0	81	6	181	3.3
128	2	0	0	0	0	0	17	0	19	0.3
256	1	0	0	0	0	0	5	1	7	0.1
Total	**2790***	**1097**	**853**	**234**	**85****	**13**	409	70	5551	100
SHAPE										
A	401	0	133	23	0	1	46	8	612	11.0
B	2389	0	417	119	8	1	357	58	3349	60.2
C	0	732	220	61	25	5	6	3	1052	19.1
D	0	294	72	23	33	5	0	1	428	7.7
E	0	66	11	6	12	1	0	0	96	1.7
F	0	5	0	2	7	0	0	0	14	0.3
Total	**2790**	**1097**	**853**	**234**	**85**	**13**	409	70	5551	100

* Hammer and upper grinding stones included in total ** Points included in total

Vogel scale, the stone artefacts vary from being <50 mm² to 25600 mm² in size. Overall, however, the majority of artefacts fall in the 200 and 400 mm² size range. Formal tools show a more limited distribution on the scale than the irregular flakes, blade flakes and cores. For obvious reasons the broken flakes tend to be more microlithic, with an index of 56,9% as compared to 38,5% at BB5. This is partly due to the smaller proportion of cores and the larger proportion of broken flakes, but the blade flakes are, on average, also slightly smaller.

The distribution in the shape classes is similar to that at BB5 with 53% of the artefacts falling into class B, *i.e.* with a *l/b* ratio between 1.4 to 2. Since there are only thirteen formal tools, statistical comparison with BB5 is not meaningful. It is however noted that only one formal tool does not fall into the microlithic category. The majority of the artefacts from both BB5 and BB7 were manufactured from chalcedony, chert, jasper, quartzite and quartz. The chalcedony and chert nodules probably originated from the Orange River (Smith 1995:292; Beaumont pers. Comm.). There are no obvious differences between the sizes of artefacts manufactured from different stone types except that the microlithic formal tools tend to be made from fine-grained material.

GRID BLOCK COMPARISONS

Based on typological and metric comparisons, BB5 and BB7 obviously represent the remains of groups with the same stone tool tradition and span approximately the same time period. It is therefore concluded that they belong to the same LSA industry. However, the relevance of this comparison relies on an analysis that was conducted in order to determine the homogeneity of the Bloubos sample. Figure. 8 shows the lithic composition of the individual grid blocks on BB5. After comparing the material from each grid block, it was found that they broadly correspond in terms of typology and size and shape, and it is concluded that little chronological depth exists on the site.

The grid block comparisons also clearly illustrate the need for at least 200 to 250 artefacts as a meaningful sample. Grid blocks with samples of less than this number produced erratic results, whereas greater numbers of artefacts did not significantly alter results. (see Figure 9 for comparative distribution histograms of the size and shape of stone artefacts of some of the grid blocks on BB5).

SITE COMPARISONS

Swartkop and Doornfontein

As summarised by Penn (1995), early European travellers in the 'frontier zone' recorded the presence of two different groups, the hunters or San and the herders or Khoi, living in relative close proximity to each other along the Orange River during the 18th century. These two distinct socio-economic systems had survived in the region since the introduction of domestic stock and ceramics some 2000 years ago. Both Beaumont (Beaumont *et al.*1995) and Smith (1995) find that they can, on the basis of the material remains, distinguish between prehistoric sites occupied by groups exhibiting these two lifestyles in the Northern Cape.

Beaumont (Beaumont *et al.* 1995:255) has defined the Swartkop Industry as representing the hunters and the Doornfontein Industry as representative of pastoralists. He sees the Swartkop aggregates as a direct development of the earlier Springbokoog Industry which is a Northern Cape variant of the Wilton Complex and is characterised by cryptocrystalline silicates, mainly chalcedony, representing up to 30% of raw material, and by high frequencies of backed blades. The Swartkop assemblages he describes as containing acicular blade

Table 4. Size and shape of the stone artefacts from site BB7. Spits 1 to 5. Spits 6 to 11.

Table 4.1. Spits 1 to 5.

Size mm²/100	Irregular flakes	Blade flakes	Broken flakes	Scrapers	Backed blades*	Segments	Irregular cores	Blade cores	Total	Frequency %
0.5	3	0	5	0	2	0	0	0	10	3.2
1	23	12	21	1	2	0	1	0	60	19.2
2	47	25	44	2	1	0	1	0	120	38.3
4	48	13	12	0	0	0	6	0	79	25.2
8	26	3	0	0	0	0	2	0	31	9.9
16	7	2	0	0	0	0	2	0	11	3.5
32	1	0	0	0	0	0	1	0	2	0.6
Total	**155**	**55**	**82**	**3**	**5**	**0**	**13**	**0**	**313**	**100**
Shape										
A	27	0	14	1	0	0	4	0	46	14.7
B	128	0	30	1	0	0	8	0	167	53.4
C	0	32	25	1	1	0	1	0	60	19.2
D	0	14	12	0	1	0	0	0	27	8.6
E	0	9	1	0	1	0	0	0	11	3.5
F	0	0	0	0	2	0	0	0	2	0.6
Total	**155**	**55**	**82**	**3**	**5**	**0**	**13**	**0**	**313**	**100**

* Points included in total

Table 4.2. Spits 6 to 11.

Size mm²/100	Irregular flakes	Blade flakes	Broken flakes	Scrapers	Backed blades	Segments	Irregular cores	Blade cores	Total	Frequency %
0.5	0	2	2	0	0	0	0	0	4	2.4
1	12	7	8	0	1	1	0	0	29	17.1
2	22	12	15	0	2	0	1	0	52	30.6
4	22	13	6	0	0	1	0	1	43	25.3
8	20	3	2	0	0	0	1	0	26	15.3
16	4	5	0	0	0	0	0	0	9	5.3
32	7	0	0	0	0	0	0	0	7	4.1
Total	**87**	**42**	**33**	**0**	**3**	**2**	**2**	**1**	**170**	**100**
Shape										
A	11	0	8	0	0	0	0	0	19	11.2
B	76	0	10	0	0	1	2	0	89	52.4
C	0	22	7	0	2	1	0	0	32	18.8
D	0	13	6	0	0	0	0	1	20	11.8
E	0	7	2	0	1	0	0	0	10	5.9
F	0	0	0	0	0	0	0	0	0	0.0
Total	**87**	**42**	**33**	**0**	**3**	**2**	**2**	**1**	**170**	**100**

with "consistently high proportions (above 60%) of backed blades amongst the formal lithics", and with undeco-rated, grass-tempered ceramics (Beaumont *et al.* 1995: 242). In time the ceramics are found to increase and the backed blades to decrease. The sites are usually situated on pan and stream margins, near water in dune hollows and on the flanks of koppies. The Swartkop "can be confidently linked, by way of a degenerate terminal phase, to the /Xam" (Beaumont *et al.* 1995: 242, 255).

The ceramic Doornfontein assemblages, on the other hand, are characterised as having only a small proportion of formal lithics and a predominance of course irregular flakes, often on quartz (Beaumont *et al.* 1995:247; Smith 1995:300). The abundant associated ceramics are usually thin-walled, grit-tempered and well fired (Beaumont *et al.* 1995:246-247). The assemblages also contain grinding grooves, large bone points, ostrich eggshell beads and simple geometric-decorated ostrich eggshell.Temporal shifts within the industry are limited. Later sites tend to contain grass-tempered ceramics, larger OES beads and more copper objects. Sites usually occur near the Orange River or at water sources close to it. The pottery "can be associated with the Khoi by way of the historic record" (Beaumont *et al.*1995:255).

The characterisation of the material remains on both hunter and herder sites will still need refinement in both a temporal and spatial sense, since there are obvious discrepancies in the literature. Thus Smith (1995:281, 284, 291) reports equal numbers of scrapers, backed blades and segments in the finds on the open site of Droëgrond B, some 55 km south-west of Kakamas, has a date of 400 ± 120 BP (Pta-2396). At this site the which he sees as a "hunters' camping place" and whichbacked blades, therefore, do not predominate, but the tables do seem to show a predominance of blade cores (Smith 1995:285).

In order to compare the Bloubos finds with other sites in the region and possibly to identify the occupants, I analysed the lithics from two of Beaumont's sites:

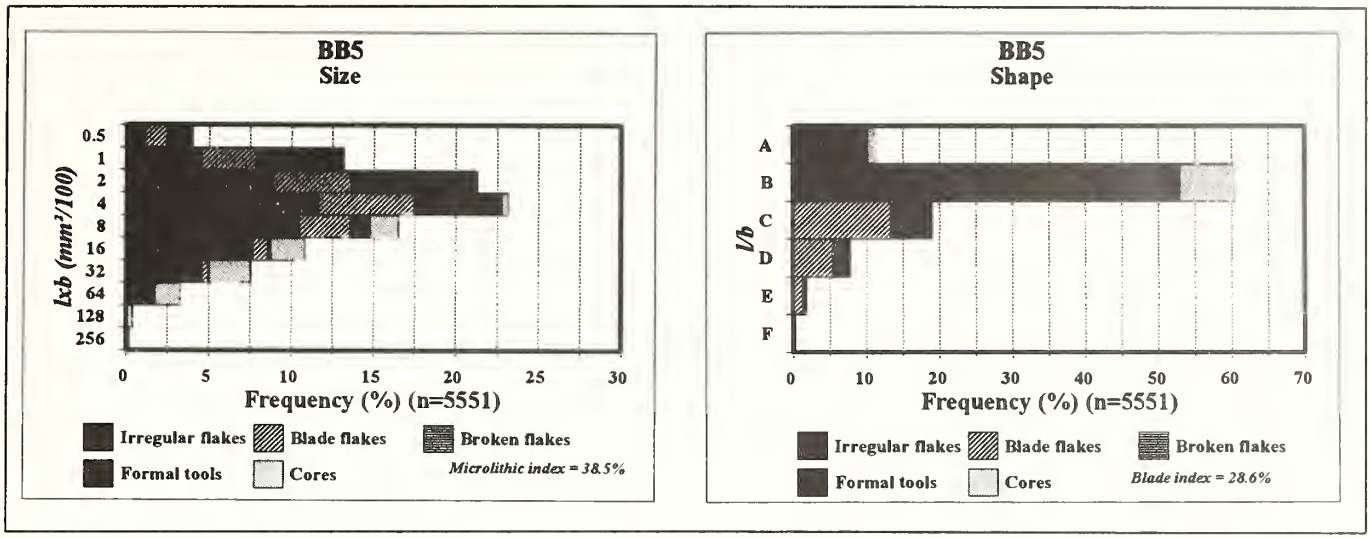

Fig. 7. Distribution histograms of size and shape classes of BB5 stone tools (see text for a definition of the size and shape classes). Although the BB5 sample is predominantly macrolithic, the whole assemblage tends towards the microlithic side of the scale (≤2). The tight distribution in terms of size and shape indicates a relatively limited time-scale for the site.

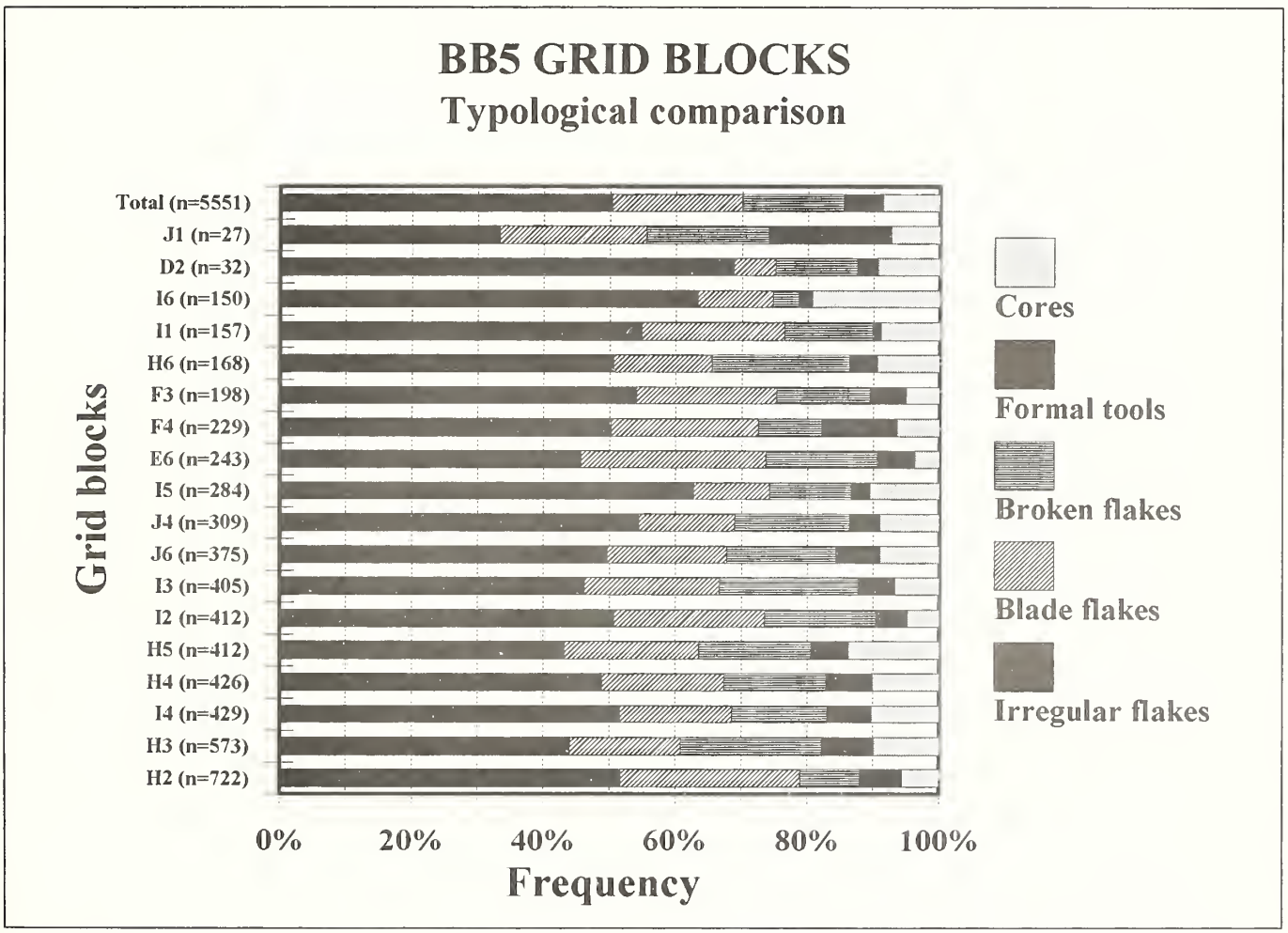

Fig. 8. Relative frequencies of the artefact types retrieved from the individual grid blocks on BB5. Thecorrespondence indicates the typological homogeneity of the site.

Swartkop 1, the type-site representing the hunters and Biesiepoort 2, a typical herder site (see Figure 1 for location). Swartkop 1 has a radiocarbon date of 670±50 BP (Pta-4106), while Biesiepoort 2 has dates of 1390 ±70 BP (Pta-4772) and 2050±50 BP (Pta-4764) (Beaumont *et al.*1995:245, 247). The artefacts from the different spits showed no variation and were pooled together for analysis.

Table 5. BB5 metric data of stone artefacts (mm).

ARTEFACT TYPE	MEAN	ST. DEV.	MEDIAN	RANGE	VOGEL SCALE
IRREGULAR FLAKES (n=2778)					
Length (mm)	26.2	15.4	22.0	5-119	
Breadth (mm)	18.3	11.5	15.0	1-80	
***lxb* (sqmm)**	640		338		386
l/b	1.50		1.43		1.50
BLADE FLAKES (n=1097)					
Length (mm)	23.6	10.3	22.0	7-106	
Breadth (mm)	9.3	4.8	9.0	2-47	
***lxb* (sqmm)**	256		200		208
l/b	2.67		2.55		2.46
BROKEN FLAKES (n=853)					
Length (mm)	15.1	5.5	14.0	4-52	
Breadth (mm)	8.8	3.5	8.0	2-31	
***lxb* (sqmm)**	143		112		127
l/b	1.77		1.71		1.82
SCRAPERS (n=234)					
Length (mm)	23.0	12.1	20.8	7-90	
Breadth (mm)	13.5	8.8	11.9	3-71	
***lxb* (sqmm)**	397		240		238
l/b	1.87		1.69		1.88
BACKED BLADES (n=83)					
Length (mm)	16.8	5.3	16.0	8-31	
Breadth (mm)	5.9	2.7	5.3	2-15	
***lxb* (sqmm)**	107		80		102
l/b	3.26		3.01		3.09
SEGMENTS (n=13)					
Length (mm)	14.4	3.2	14.07	10-20	
Breadth (mm)	5.8	2.3	5.42	4-10	
***lxb* (sqmm)**	86.7		65		66
l/b	2.70		2.60		2.73

Comparison of the typologicalresults with Bloubos is shown in Figures 4 to 6. The proportions of the main classes (utilised flakes, cores and formal tools) are similar at all three sites, while Swartkop shows a higher proportion of utilised blade flakes and blade cores than the other two sites. In the formal tool categories, the complete predominance of backed pieces in the Swartkop collection differs markedly from Biesiepoort

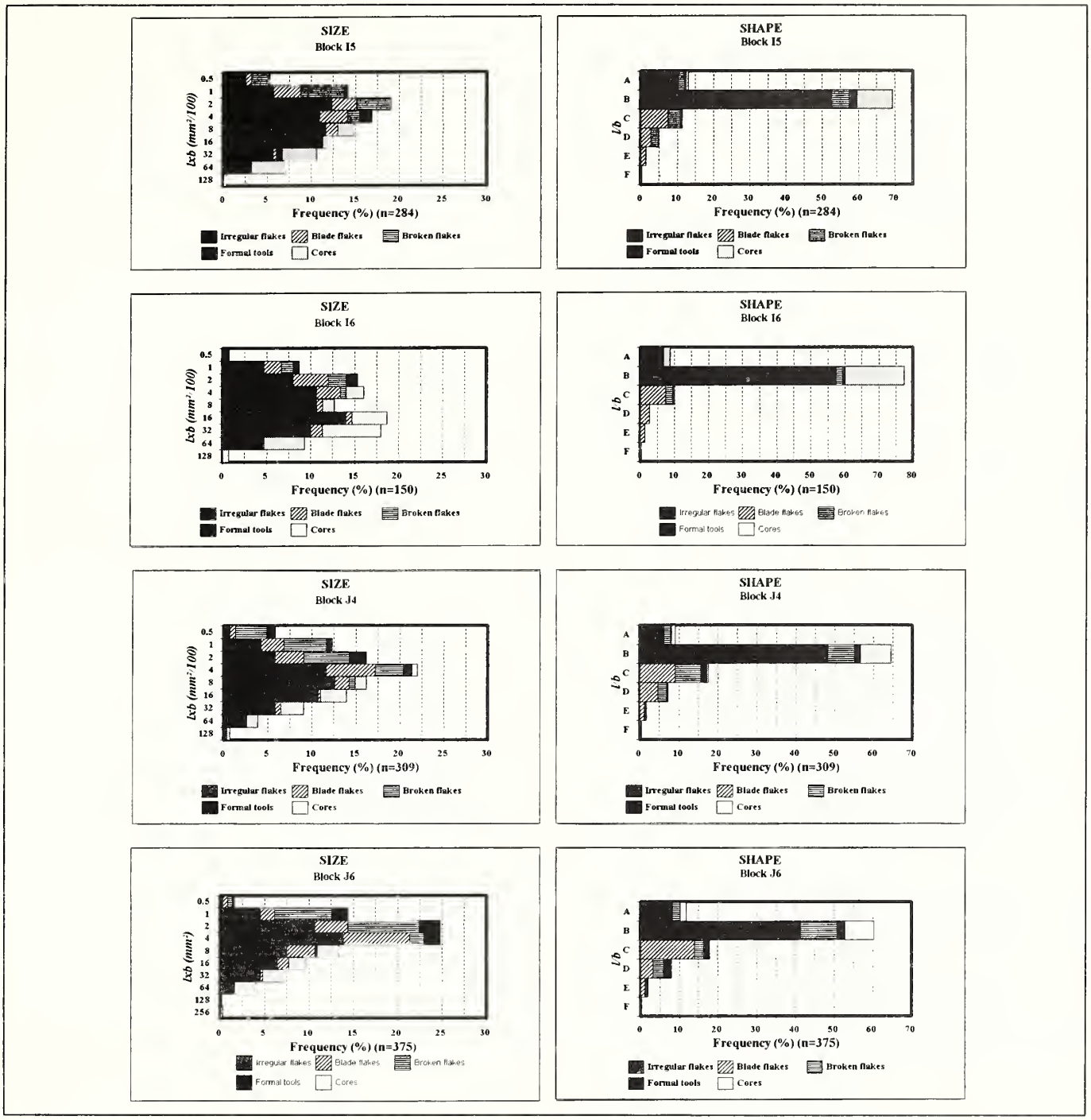

Fig. 9. Comparative distribution histograms of the size and shape of stone artefacts from some grid blocks on BB5 indicate that variation in individual sample sizes influences the distribution of artefacts within classes. Samples with less than 200 to 250 artefacts are less evenly distributed than those with more.

and Bloubos.

The metric analysis (Fig.10) shows that the Biesiepoort 2 artefacts are slightly smaller than those from Bloubos, presumably because they were primarily made from quartz. The Swartkop 1 artefacts (Fig. 11) are larger, mainly due to the greater number of relatively large blades, and clearly show this blade predominance in the shape categories.

Despite the fact that the Doornfontein herder industry is said to have a small formal lithic component, these comprise 7,4% of the utilised pieces at Biesiepoort 2 (2,5% including waste), compared to 6,0% at BB5 (3,0% including waste) and 6,0% (2,2% including waste) at Swartkop 1. This suggests that there is some leeway in the size of the formal tool components of herder sites. Overall the conclusion is that the lithics from Bloubos are very similar to those from the herder site at Biesiepoort and differ from those at the hunter site Swartkop 1

DISCUSSION AND CONCLUSIONS

Hunters or herders

The differences between the Swartkop and Biesiepoort assemblages are perceived as the result of divergent subsistence strategies. Composition of the

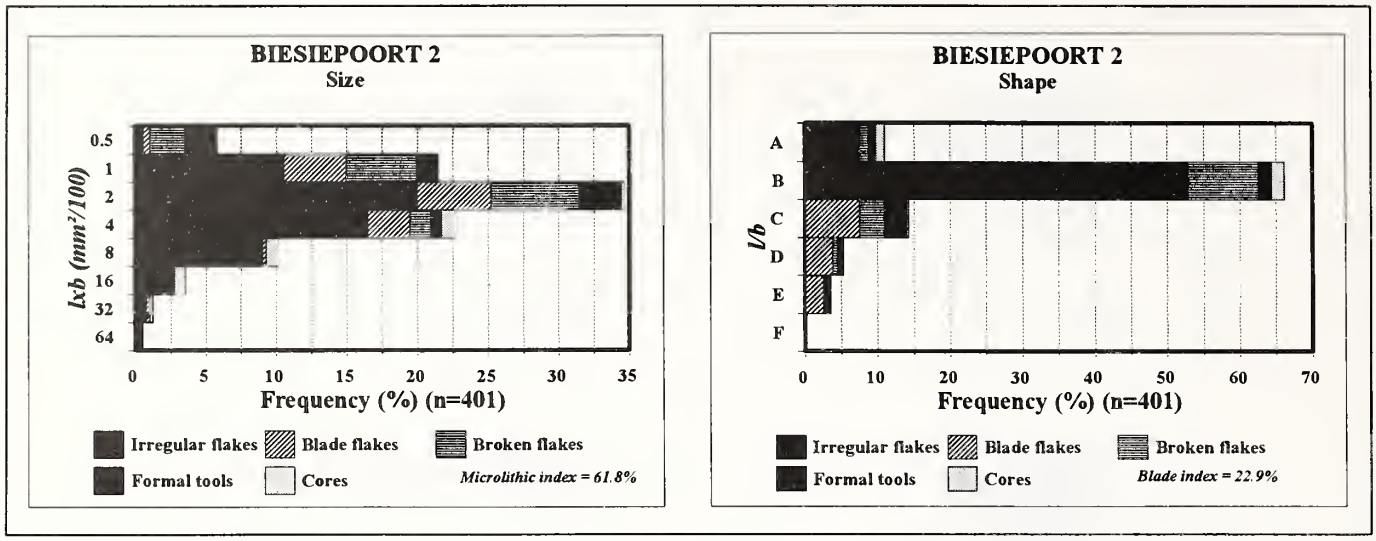

Fig. 10. Distribution histograms of size and shape classes of Biesiepoort 2 stone tools. Although the sample peaks on the microlithic end of the size histogram, the general distribution between both the size and shape classes is similar to those of BB5.

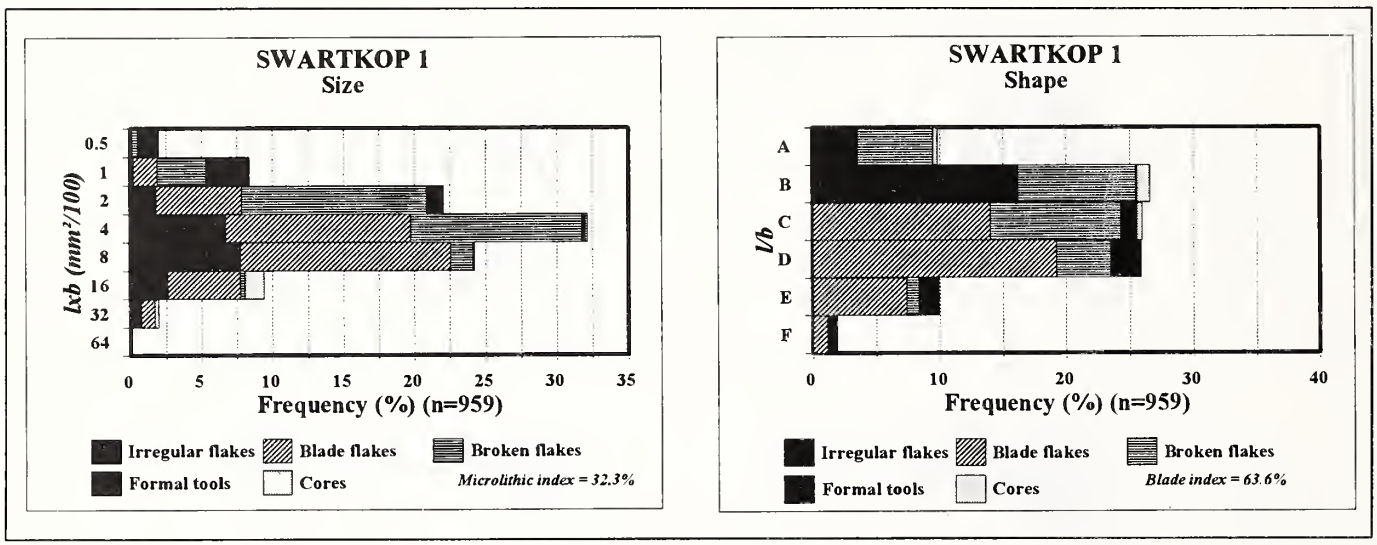

Fig. 11. Distribution histograms of size and shape classes of Swartkop 1 stone tools. The bladelike nature of this assemblage is clearly visible in the shape distribution histogram.

lithics from BB5 implies that the site was predominantly occupied by herders and not a hunter camp site. Due to the lack of permanent water it would only have been visited after local rains had supplied grazing and surface water in the desert. The opportunity to hunt and forage in the area provided an additional attraction to the pastoralists. Bloubos thus provides evidence that the pastoralists living along the Orange River intermittently exploited the resources of the landscape up to two days trek away from the river.

Methodology

The Vogel scale is an innovative alternative to conventional measuring techniques.It places the artefacts directly into size and shape classes which are just recognizably different and the variation in the shape and size of objects is directly visually shown. It eliminates the need to measure each individual artefact and provides a more detailed presentation of the distribution than the conventional presentation of mean, standard deviation and range. The Vogel scheme is a precise, standardised measuring method applicable to any collection of artefacts. Simultaneously, some leeway within size and shape classes is provided for which minimizes the influence of a few very large and/or small artefacts on the calculated mean value of a collection.

Bloubos open-air sites

The artefact analysis revealed that when samples of some 250 or more utilised artefacts are analysed, the results for the individual grid blocks are similar while smaller samples show larger variation. The conclusion is that one needs at least 200 to 250 utilised artefacts to obtain a representative sample. Since the samples from the grid blocks are more or less homogeneous, a smaller sample from BB5 would have been adequate.

Another interesting observation is the high frequency of scrapers manufactured on broken flakes with the bulb of percussion still visible. As indicated in Table 1, more or less equal numbers of proximal and distal fragments of broken flakes would be expected, but the distal ends predominate. This discrepancy indicates that the proximal ends were preferably selected for manufacturing scrapers.

Bloubos was, although not permanently, intensively occupied during the past 2000 years. The numbers and sizes of LSA surface scatters in the area confirm that the region played an important role during the LSA. This emphasizes that the recording of open-air sites in the environment are necessary to obtain a complete record of the utilisation of resources in the landscape - something that the sole reliance on cave sites does not produce.

ACKNOWLEDGEMENTS

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A HUMAN GRAVE FROM THE FARM HAMILTON IN THE LIMPOPO RIVER VALLEY (SOUTH AFRICA)

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ABSTRACT

Human skeletal remains are valuable sources of information on past lifestyles and health. A human skeleton was recently discovered on the farm Hamilton, on a site which is linked with the Mapungubwe cultural landscape (AD 1216 (1244) 1267). Recent archaeological investigations have focussed on sites in the vicinity of Mapungubwe, in order to establish where these sites were situated, whether they were linked to Mapungubwe, and what their functions were. The skeleton (UP 138) was found in an ash midden, and was horizontally flexed on its right side with the hands under the skull. It is the remains of an adolescent individual who showed clear signs of *cribra orbitalia*.

INTRODUCTION

The Mapungubwe complex of sites continues to create interest amongst archaeologists and historians. These sites, situated close to the confluence of the Limpopo and Shashi rivers, include K2, Mapungubwe and several smaller sites on the farm Greefswald. Other sites which previously yielded dates and material relevant to the K2/Mapungubwe cultural complex were found on the farms Schroda (Hanisch 1980), Samaria, Pontdrif (Hanisch 1980), Stayt (Hutten & Steyn 1998), Skutwater (Van Ewyk 1987), Kromdraai 2 and 3, Ntanye (West Nicholson, Zimbabwe), Glennel (De Villiers 1980), and others (cf. Vogel 1998:298-299). In the quest for a better understanding of the context of K2/Mapungubwe and its inhabitants, the archaeological focus has shifted to sites in the vicinity of Greefswald.

Excavations were conducted by the University of Pretoria during 1999 at satellite sites in the region, as part of a project to identify, localise and date all archaeological sites within the borders of the planned Limpopo Valley National Park. This information will be used in the management plan of the new National Park which will include many and highly significant archaeological sites (SANP 1997). Moreover, the research is also aimed at a better understanding of the economical activities and physical layout of the interconnected sites which form part of the broad K2/Mapungubwe complex. As part of the investigation into the K2/Mapungubwe satellite sites, excavations were conducted on the farm Hamilton, which is situated about 6 Km south of K2/Mapungubwe (Fig. 1). During September 1999 a human grave was discovered in ash deposits on this site.

THE SITE

The Hamilton archaeological site comprises of ash middens related to cattle kraals. The site presumably represents a cattle post of the high status community of Mapungubwe. No surface indications of structures like stone walls or any other buildings were found, with the possible exception of a small area of exposed hut floor, in an area which was not excavated.

Numerous rodent tunnels occur in the deposits, exposing many items of archaeological interest. The surface survey yielded pottery, glass beads (including a broken garden roller), animal bones and fragments of tuyères. These finds are indicative of a possible connection with the K2/Mapungubwe culture. The potsherds found in the excavation show close relationships with the later Mapungubwe material.

Three test trenches were excavated in ash deposits on Hamilton. The ashy soil stretches over an area of approximately 800 metres long and 30 to 45 metres wide. The test excavations, designated Map 22, 23 and 24, were placed randomly across the ash deposits. Each of these

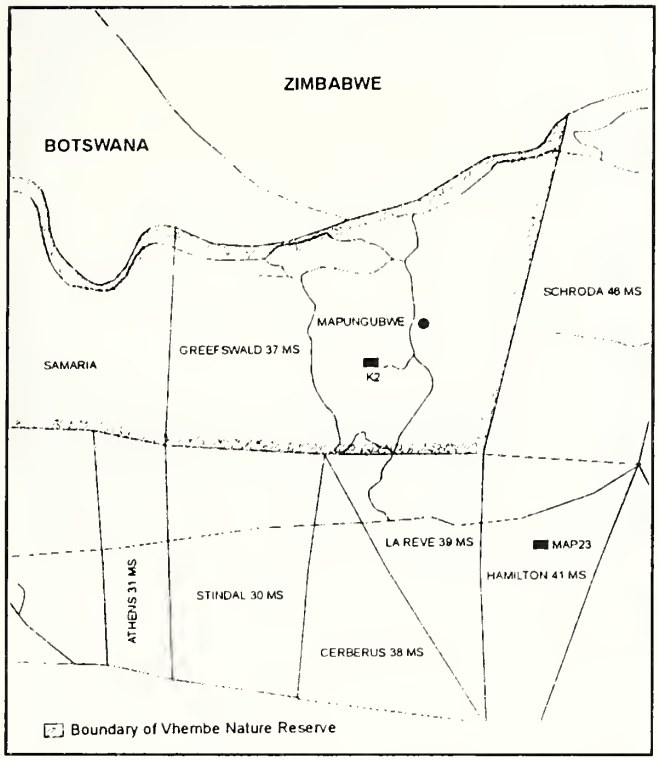

Fig. 1. Location of Hamilton (MAP 23). Modified from a map obtained from Department of Anthropology and Archaeology, in co-operation with Centre for Geo Information Science (University of Petoria).

trenches was 2 m x 2 m. The aim with these test excavations was to identify, localise and date the ash midden deposits. The excavations were not aimed at finding skeletal remains, but when a skeleton emerged during the excavation of Map 23, it was excavated.

The excavation area, designated Map 23, is situated at the southern edge of the ash deposits close to an area where rodent activity exposed potsherds which, based on decoration and typology, suggested a relationship with the pottery of Mapungubwe. Excavation through approximately 20-35 cm of ashy soil terminated in a layer of red gravel which was not excavated. A small test trench suggested that the red gravel (consisting of red shale of the karoo-system) was the natural soil surface on which the ash midden was situated. Almost in the centre of the excavation a human skeleton was found, buried in the ash midden and lying on the red gravel. There was no indication of a hut floor or any other structures in the close proximity of the grave.

The grave

No surface indication of a grave was observed. The body was buried in a flexed position on its right side, facing southwest with the right hand under its head and the left hand just in front of the face (Fig. 2). The skull was exposed at a depth of 17cm below the present surface. A small clay vessel, almost complete but broken into four pieces, was found in front of the skull (Fig. 3). This pot, however, was not typical of the Mapungubwe phase. It was a small bowl which resembled a child's work. The clay work and surface were both quite uneven,

Fig. 2. UP 138 *in situ*.

while the decorations were very shallow and unsophisticated. The clay vessel was broken and placed in front of the face. The only other cultural objects present were 26 glass beads (25 blue and one black), found near the cervical vertebrae, and a few large potsherds which seem to have demarcated the grave. This demarcation may resemble very closely the description of Gardner of the skeleton K.S. No. 10. He describes it as follows: "Child, 11-12. On right side facing south. Skull very badly crushed and position difficult to detect, but thought to be fully flexed. A true pot burial. Surrounded by five large sherds, two against the skull" (Gardner 1963:41). Gardner's true pot burial here refers to a burial where the body is surrounded by pots or potsherds, and not to a burial where the body was placed inside a pot.

Indications of a grave pit were only found in the area around the skull, where slight colour differences in the matrix were observed. The absence of clear indications of a grave pit may have been the result of the shallowness of the grave and the effect of roots and rodent activity, which disturbed the soil. The skeleton was almost complete, except for parts of the left lower limb which may have been lost due to postmortem scavenger activity.

THE SKELETON

The skeleton is very well preserved, and is complete with the exception of most of the left lower limb, a cervical vertebra and some missing hand and foot bones. Of the left lower limb only the proximal tibial epiphysis and the first metatarsal are present. The skull, although complete, had been crushed on its right side, precluding the possibility of a full set of cranial measurements (Fig. 4). The left side is intact and not distorted. Except for both lower central incisors which had been lost postmortem, all teeth are present. The skeleton is now housed in the Dept. of Anatomy, University of Pretoria under the accession number UP 138.

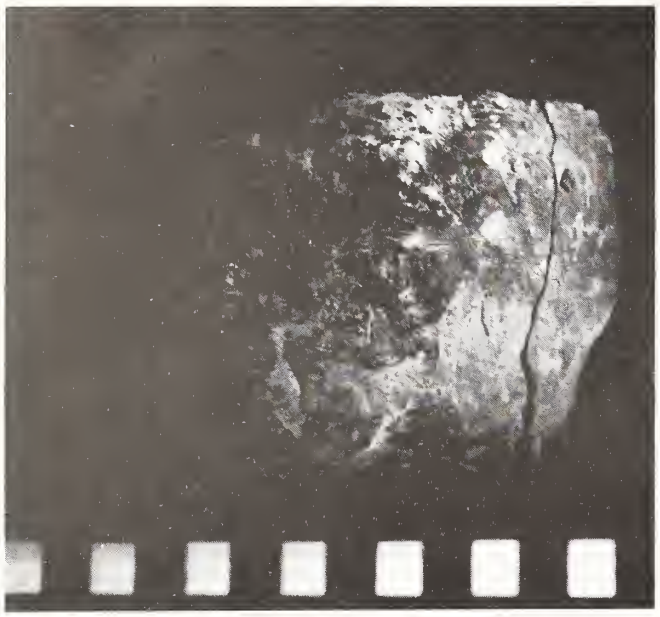

Fig. 3. The small pot found with the skeleton.

Fig. 4. Skull of UP 138 in lateral view.

Age and sex

The skeleton is clearly that of a sub-adult individual. The set of permanent teeth had fully erupted in the lower jaw, but the upper jaw lacks third molars. There is, however, very little room in the maxilla for these two teeth, and the possibility of non-development of the third molars must be considered. Wear facets are present on the lower third molars, indicating that they have been in use for a while. Most of the epiphyses are still open, and the three elements of the innominate are unfused. Of the major long bones, only the distal ends of both the humeri have united, but the epiphyseal lines are still clearly visible. The combination of unfused pelvic elements and presence of third molars is unusual, and it may be possible that skeletal maturation is delayed in relation to dental eruption. This is supported by the presence of indicators of stress/disease (see "health and lifestyle") in this individual, which may have contributed to retarded skeletal maturation. All these features indicate a young (adolescent) individual, probably around 14 - 17 years old (Ferembach *et al.* 1980, Krogman & İşcan 1986; Scheuer & Black 2000).

Sex determination is notoriously unreliable in sub-adults. The sciatic notch is very narrow, and the ilium, as seen from above, is curved. No firm diagnosis of sex could be made.

Population affinity

Determination of population affinity is also difficult in subadults, but it seems as though specific population-group related features may be discernible from about 5 - 6 years of age (Steyn & Henneberg 1997). The narrow skull and shape of the nose (nasal index 48) indicate a person of South African Negroid descent (De Villiers 1968). A list of the measurements that were possible is shown in Table 1. For this purpose the system as proposed by Buikstra & Ubelaker (1994) was used.

Long bone growth

Data on long bone growth of adolescent individuals are very scarce, as adolescents are poorly represented in all skeletal samples. The most obvious sample to compare this individual to would be the Mapungubwe/K2 collection. Even though this skeletal collection comprises of more than 110 individuals, only 13 skeletons are available in the 10 - 14 year category, and 4 in the 15 - 19 year old category. Depending on the type of long bone considered, only 2 - 4 individuals had bones intact enough to measure (Steyn & Henneberg 1996).

Long bone lengths of the Hamilton individual are comparable to those of other similarly aged individuals from K2, as well as individuals from Altenerding, Germany (Sundick 1978) and Libben (Lovejoy et al 1990). Comparison with these groups are shown in Figures 5 (humerus, as an example of an upper limb bone) and 6 (tibia, as an example of a lower limb bone). No obvious growth retardation in relation to these other groups could be seen. It should, of course, be kept in mind that all the individuals in these studies died early in life, and may thus not be representative of the normal, healthy, living population.

Dentition

The two lower central incisors were lost post-mortem. This individual had only one upper lateral incisor - the left one either did not develop or was lost very early in life, as there is no room in the maxilla for it. The right upper lateral incisor is very small and rounded/peg-shaped (Fig.7). Peg-shaped abnormality of a lateral incisor was also found in an individual from Mapungubwe Hill. This individual was about 12 - 13 years old, and had many enamel hypoplastic lesions on the teeth (Mapungubwe skeleton 622a). Unfortunately this skeleton is very poorly preserved, and no other data could be obtained from it. Variations in dental morphology, such as seen in the Hamilton individual, are often used in an attempt to trace genetic relationships between groups. Upper lateral incisors are more variable in size and shape than most

Table 1. Measurements of skull and mandible of UP 138 (Buikstra & Ubelaker 1994).

Dimension	mm
Max. cranial length	186*
Max. cranial breadth	-
Bizygomatic	-
Basion-bregma	136
Basion-nasion	113
Basion-prosthion	108
Maxillo-alv. breadth	51
Maxillo-alv. length	48
Biauricular breadth	114
Upper facial height	74
Min. frontal breadth	108
Upper facial breadth	-
Nasal height	54
Nasal breadth	26
Orbital breadth	42
Orbital height	39
Biorbital breadth	-
Interorbital breadth	22
Frontal chord	107
Parietal chord	123
Occipital chord	90
Foramen magnum length	39
Foramen magnum breadth	28
Mastoid length	27
Chin height	34
Height of the mandibular body	33
Breadth of the mandibular body	10
Bigonial width	88
Bicondylar breadth	105
Min. Ramus breadth	31
Max. Ramus breadth	41
Max. Ramus height	50
Mandibular length	77
Mandibular angle	144

*estimates

Table 2. Postcranial measurements of UP 138. All maximum lengths of long bones are diaphyseal lengths (Buikstra & Ubelaker 1994).

Dimension	mm
Clavicle, max. length	113
Clavicle, ant-post diameter, midshaft	9
Clavicle, sup-inf diameter, midshaft	6
Humerus, max length#	270
Humerus, epicondylar breadth*	52
Humerus, max. diameter, midshaft*	16
Humerus, min. diameter, midshaft*	12
Radius, max. length	209
Radius, ant-post diameter, midshaft	8
Radius, med-lat diameter, midshaft	13
Ulna, max. length	228
Ulna, min. circumference	27
Os coxae, iliac breadth	106
Femur, max. length	374
Femur, ant-post subtrochanteric diameter	16
Femur, med-lat subtrochanteric diameter	24
Femur, ant-post midshaft diameter	20
Femur, med-lat midshaft diameter	19
Femur, midshaft circumference	58
Tibia, length*	310
Tibia, max. diameter at nutrient foramen*	23
Tibia, med-lat diameter at nutrient foramen*	18
Tibia, circumference at nutrient foramen*	66
Fibula, max. diameter at midshaft*	10

#distal epiphysis fused, measurement taken to still clearly visible epiphyseal line
*measured on right side
med-lat = mediolateral; ant-post = anteroposterior; max. = maximum; min. = minimum; sup = superior

other teeth (Scott & Turner 1997). These upper lateral incisor abnormalities show patterns of geographic variation, and occur in 0 - 5 % of people in specific populations. Their frequencies in many populations, and their significance, still need to be further investigated.

As mentioned previously, the third upper molars are also not present An unusual wear pattern is present, since all anterior teeth (especially the uppers) are much more worn than the posterior ones. It does not seem as if considerable overbite was present, and it may be possible that this individual may have used his teeth for purposes other than masticating, *e.g.*, for some sort of craft or tool-making. One large carious lesion is present on the occlusal surface of the right lower first molar. No signs of enamel hypoplasia were found.

Health and lifestyle

Pronounced cribra orbitalia is present, so that the various foramina are coalescing (Fig. 8). Cribra orbitalia usually presents in the roof of the orbits as small pits. It is caused by anaemia, resulting in red blood cell formation in the bone marrow of the skull (Stuart-Macadam 1987a, 1987b, 1989). In severe cases, this anaemia may also present as small pits on the rest of the skull (porotic hyperostosis) which was not observed in this case. Anaemia is not necessarily diet-related, but may rather be an indication of the pathogen load an individual has to cope with. Hypoferraemia, resulting in anaemia, is an adaptation that serves as a defence mechanism and can be seen as an evolutionary reaction to invasion by micro-organisms (Stuart-Macadam 1992). The cribra orbitalia seen in this individual may thus have been the result of a number of factors, *e.g.*, an attempt to cope with an acute infection in the period preceding death, chronic low grade parasitic infections or a low iron diet. Although cribra orbitalia was found in 39.5% of K2/Mapungubwe individuals with intact orbits, none of them had it to the advanced degree that what was

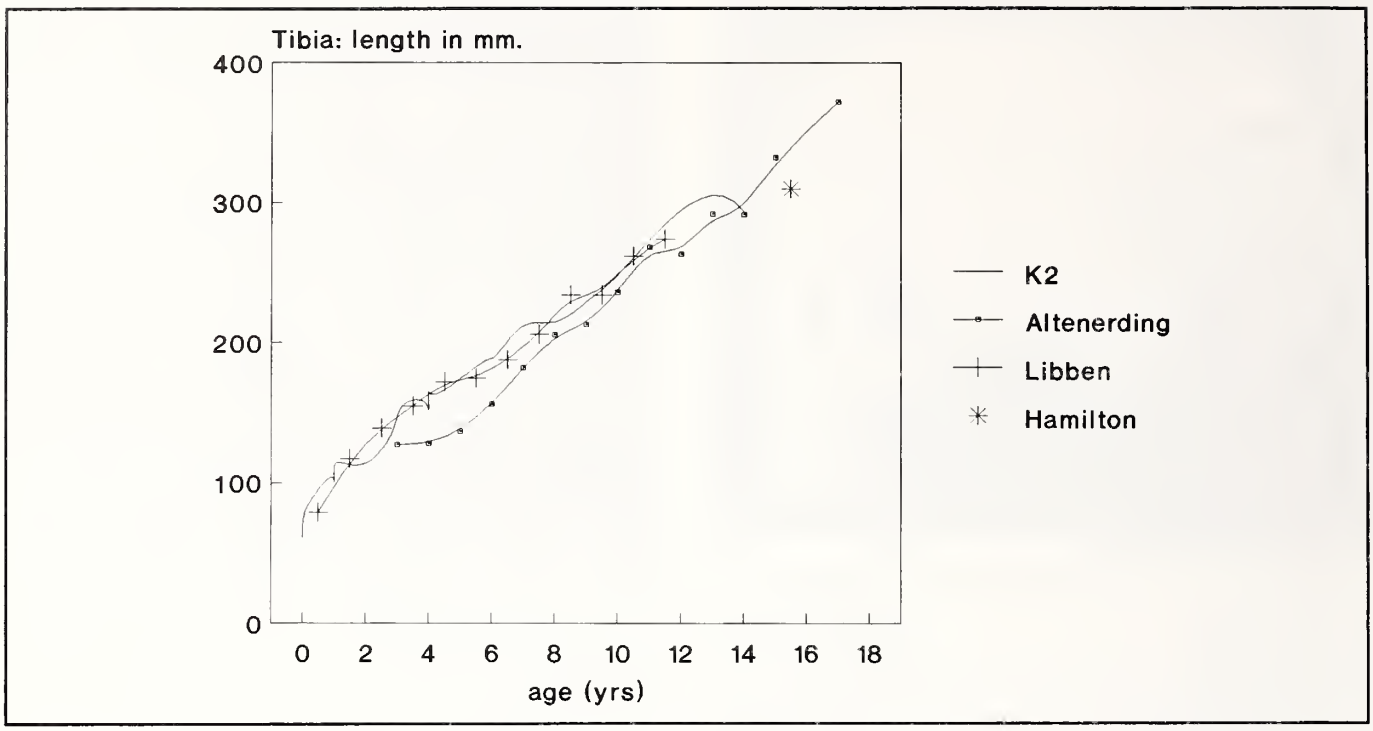

Fig. 5. Long bone growth of the humerus of UP 138, in comparison to other populations.

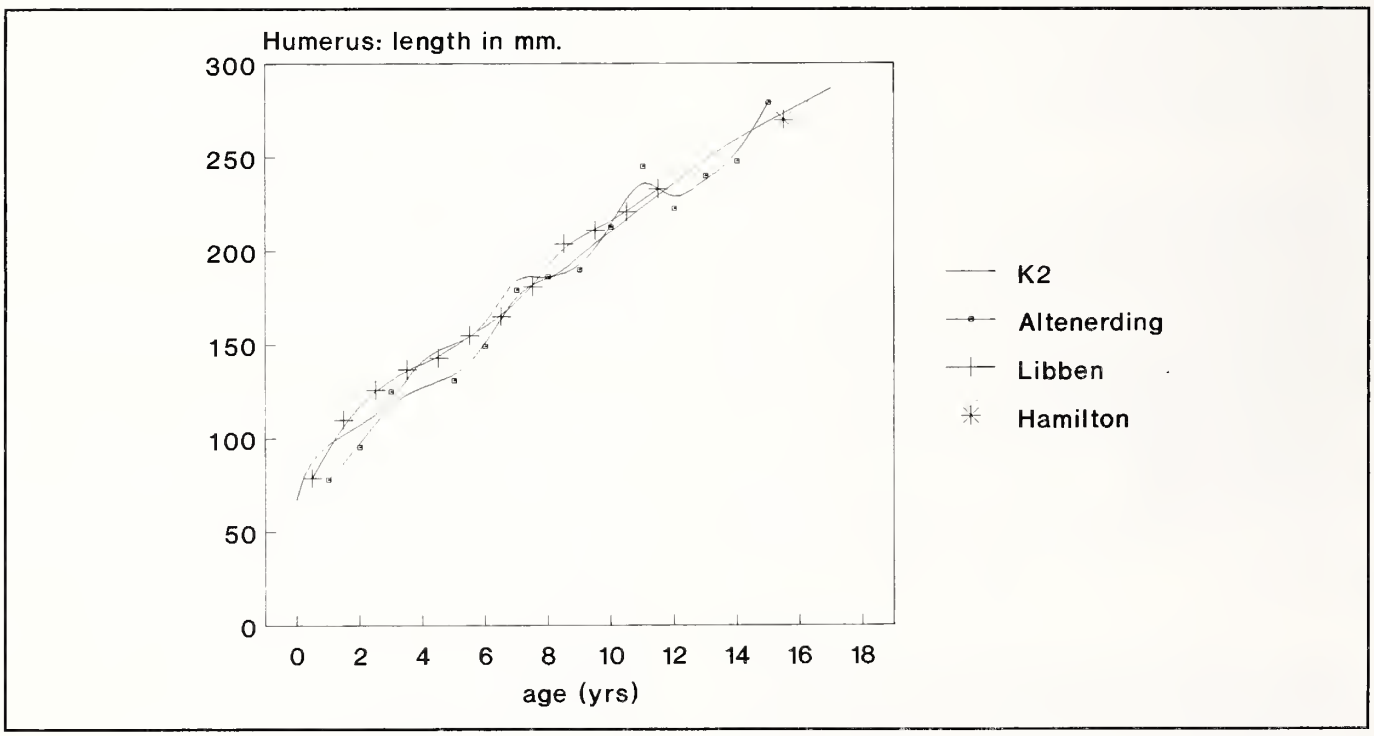

Fig. 6. Long bone growth of the tibia of UP 138, in comparison to other populations.

observed in UP 138 (Steyn & Henneberg 1995). There were no signs of subperiosteal bone growth on any of the long bones.

Another unusual feature on this individual is the fusion of the navicular and medial cuneiform bones of the right foot (left foot absent). This is not one of the abnormalities mentioned in the Bergman et al (1988) synopsis of human anatomic variation, and it is unclear whether it is of clinical significance.

RADIOCARBON DATING

A calibrated date on charcoal from layer 2 in the test excavation is AD 1223 (1239) 1265 (Pta 8023), while the date on bone from the skeleton is AD 1216 (1244) 1267 (Pta8016). These dates place the burial in one of the later phases (Phase III) of occupation at Mapungubwe, which is concentrated on the Southern Terrace (Meyer 1998:181, 298).

Fig. 7. The peg-shaped lateral incisor.

Fig. 8. Cribra orbitalia in UP 138.

DISCUSSION

The skeleton is probably that of an adolescent individual, who was between 14 and 17 years of age. Signs of chronic disease were present, but the exact nature thereof is not clear. Dental decay is present, and some tooth abnormalities were observed. Adolescent individuals are not commonly encountered in the skeletal record, as people are usually quite healthy during this age period. In modern societies one of the most common causes of death in this age groups is accidents/trauma, but the clear indications of disease in this case show otherwise.

There is no non-intrusive way to tell whether there are more graves in the Hamilton midden. However, further excavations in the vicinity may shed light on other basic questions like where these people lived, how many they were, and what their relationship with the high status community of Mapungubwe was. It will also be valuable to establish whether this community was a small subsistence farming community, or whether they were tending the cattle for the royals.

Little is known about the site where this individual came form, but it would be interesting to see whether the individuals from the Mapungubwe/K2 satellite sites enjoyed the same relative degree of affluence as those from the larger metropolis. Human remains are a valuable source of information on past life styles, adaptation and health. Quite a few skeletons from these satellite sites are available (Steyn & Nienaber 2000), although no real effort has been made to study these remains with the aim of obtaining information on general health status. In the case of one of the Schroda skeletons, though, it was noted that severe osteomyelitis was present. Should these remains be studied systematically, and more skeletons be uncovered, a relative comparison of life expectancy and general health status of people not living inside the larger K2/ Mapungubwe itself, could be made.

The placement of this skeleton in the ash midden is not unusual, as the midden was commonly used for burials. At K2, for example, most graves were found in the main midden (Gardner 1963). Many of these were graves of juveniles, but a few adult male and female burials were also discovered. The horizontally flexed position, on one of the sides, is the general pattern seen for burials in the Limpopo Valley (Steyn & Nienaber 2000). The way in which the hands were positioned under the head, reminds of the female individual from Thulamela who was buried in similar style (Steyn *et al* 1998). As far as the burial pattern for this individual is concerned, it can thus be assumed that he was most probably a member of the general population of the area, of relatively low status.

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EXCAVATION OF A LATE IRON AGE SITE IN THE MAKGABENG, NORTHERN PROVINCE

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ABSTRACT

This paper reports on the excavation of a Late Iron Age settlement in the Makgabeng. The site is radiocarbon dated to the 16th and 17th centuries AD. The ceramics belong to the Moloko cluster found in Northern Province as well as in Botswana. Large amounts of iron slag and tuyère pieces indicate that iron-working took place on the site. A number of metal artifacts were retrieved as well as ostrich eggshell beads and glass beads. The faunal assemblage from this site shows marked differences from other Moloko sites in the area.

INTRODUCTION

The excavation and material discussed in this paper forms part of a much larger project, of which the main aim is to construct a sequence for the Iron Age around Blouberg and Makgabeng in Northern Province, and to compare the different units in this sequence to those from other areas.

The Makgabeng area is situated approximately 100 km northwest of Pietersburg (Fig. 1). This forms a 'highland' and is, geologically speaking, made up of the Makgabeng Formation, which is an uniform reddish to yellowish sandstone. This sandstone is in all probability aeolic in origin and was laid down from the northeast. In some places the Mogalakwena conglomerate is also found (Brandl 1986:24). The sandstone splits easily into slabs that can be broken down into pieces that can be used for building walls. Secondly, this geology is also conducive to the formation of small plateaus or 'shelves', some of which are big enough to support a homestead. Thirdly, the sandstone erodes easily, producing a large number of rock shelters that were occupied by Stone Age as well as Iron Age people.

The vegetation on the plain surrounding Makgabeng is dominated by Mixed Bushveld, while the vegetation in the Makgabeng itself is Sourish Mixed Bushveld (Acocks 1975). Large areas have been denuded of vegetation, giving rise to erosion and secondary growth, such as sekelbos (*Dichrostachys* sp.).

SITE DESCRIPTION

The site, coded as 2328BB5 (TM3), is located on a natural shelf below the perpendicular cliff forming the Makgabeng highland, on the farm Millbank 325LR in the Bochum district of Northern Province (Fig. 2).

As stone walls occur on the site, multiple occupation was suspected. In the area where the excavations took place, some very rudimentary walling exists. These primarily serve as terracing to produce small platforms, possibly for occupational purposes, or to link some of the natural boulders together to form spatial divisions. It is possible that some walls have been robbed by builders of later walling located a short distance to the east.

This second category of walling is associated with Venda-speakers that settled at a later date in the area. These latter settlements occur over a large section of the adjoining farms of Millbank and Lomondside.

THE EXCAVATIONS

As there is little deposit on the site, only a few small trenches were excavated. The exception was TM3/1, a 3 x 3 m block dug into an ash heap down to a depth of 85 cm. It was specifically chosen as it was the largest midden on the site. The stratigraphy was simple and consisted of eight layers, arbitrary excavated in 10 cm bits. Although a few smaller lens-like features were observed during the excavation, these were considered not to be of much significance.

Evidence of metal working, in the form of ore, slag and tuyère fragments, was found scattered throughout the site, but was concentrated mainly in three places. One of these, up the slope and to the south east of ash heap 1 (TM3/1) was excavated. This second excavation, TM3/2, was a 1 x 1 m block set out over a concentration of iron slag and pieces of tuyères. Although no sign of the furnace was found, pieces of clay encrusted with slag were found. The ore was small pieces of magnetite.

Two other smaller ash middens were also excavated: TM3/3 was a 2 x 1 m unit dug down to a depth of 20 cm; TM3/5 was a 1 x 1 m square dug to a depth of 10 cm. The last excavation, TM3/4, was a 1 x 1 m square to recover a large section of pot protruding from the ground.

THE FINDS

Pottery

The excavated pottery sample small. It was there-

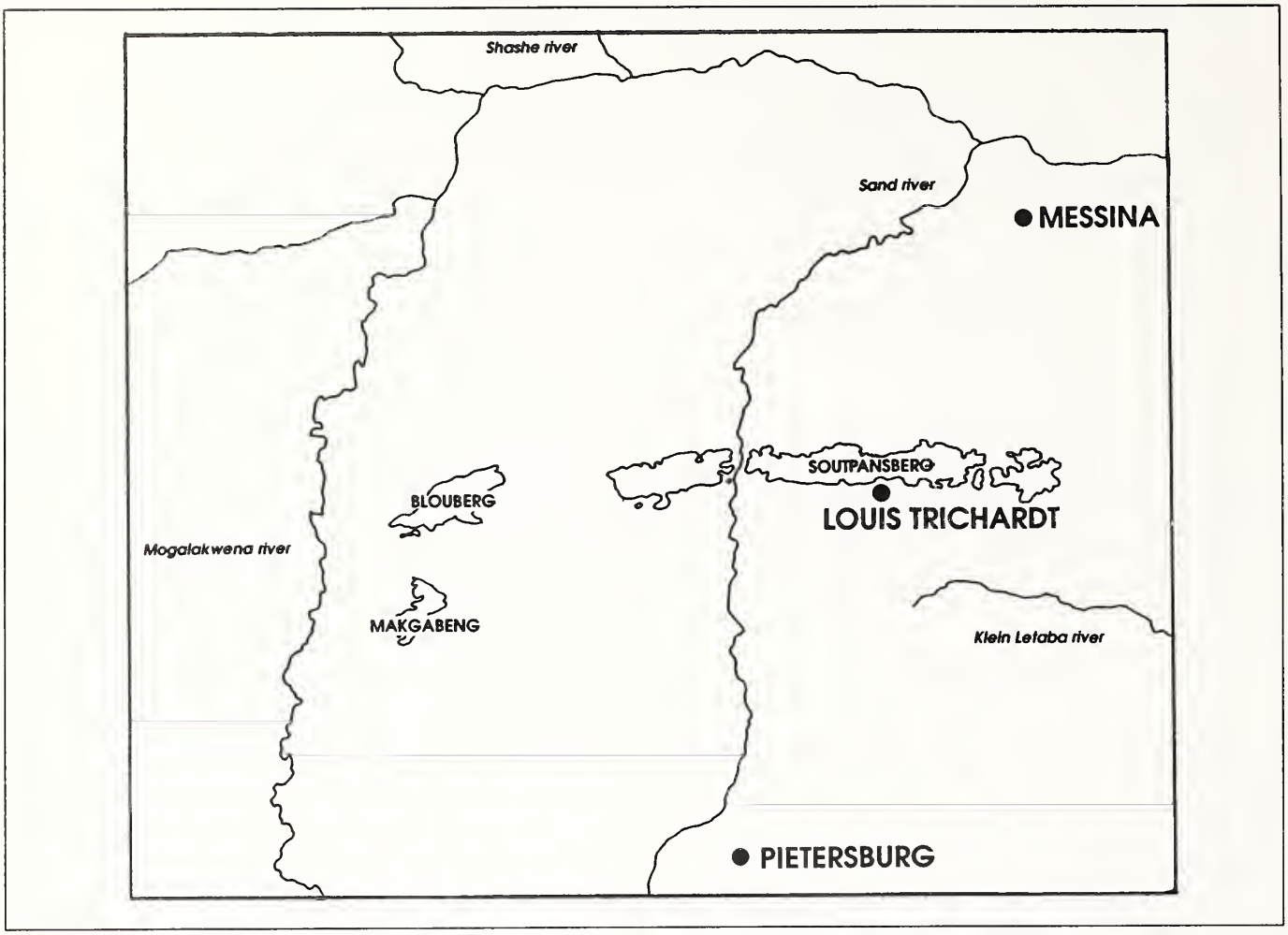

Fig. 1. Location of the Makgabeng area, Northern Province.

fore supplemented by an extensive surface collection in the areas surrounding the various excavations.

After reconstruction it was possible to identify 38 different vessels, 6 of which are plain. The pottery was analysed according to procedures proposed by Huffman (1980). In it, multidimensional types are formed by using three independent variables: vessel profile, decoration layout and decoration. Three profiles were identified:

1. necked pot with a slightly everted lip
2. pot with a poorly defined neck
3. bowls

A number of decorating techniques were employed, all of which seems to occur about equally: comb-stamping occurs on 9 of the vessels, incised decoration on 10 vessels, punctate on 7 vessels and rim nicking on 8 vessels. Some of these occur in different combinations. The decorations were grouped according to placement:

Area 1: decoration found on the lip
Area 2: decoration found on the rim of the lip and immediately below it
Area 3: decoration on the neck and shoulder

By combining dimensions of shape, area of decoration and motive, there are 8 classes of pottery (Fig. 3 & 4):

Class 1: Necked pot with a band of horizontal comb-stamping below the lip. On the shoulder comb-stamped chevrons occur, coloured alternatively with red ochre and graphite (3) (Fig. 3.1-2)
Class 2: Pot with a poorly defined neck, with a single band of nicking on the rim of the pot (3) (Fig. 3.5)
Class 3: Pot with a poorly defined neck, with a wide band of comb-stamped or incised decoration on the neck and shoulder (11) (Fig. 3.3)
Class 4: Pot with a poorly defined neck, with a band of nicking on the rim, followed by a wide band of comb-stamped or incised decoration on the neck and shoulder of the pot, followed immediately with a band of chevrons below this (5) (Fig. 3.4)
Class 5: Bowls with comb-stamping or incised decoration just below the rim (6) (Fig. 4.7-8, 4.10)
Class 6: Bowls with rim nicking and a band of incised decoration below the rim. Graphite has been applied on the inside (2) (Fig. 4.6)
Class 7: Bowl with rim nicking only (2) (Fig. 4.9)

Other ceramic objects are what seems to be a handle for a pot, showing bands of punctate decorations running lengthwise on the outside of the handle. A large spindle

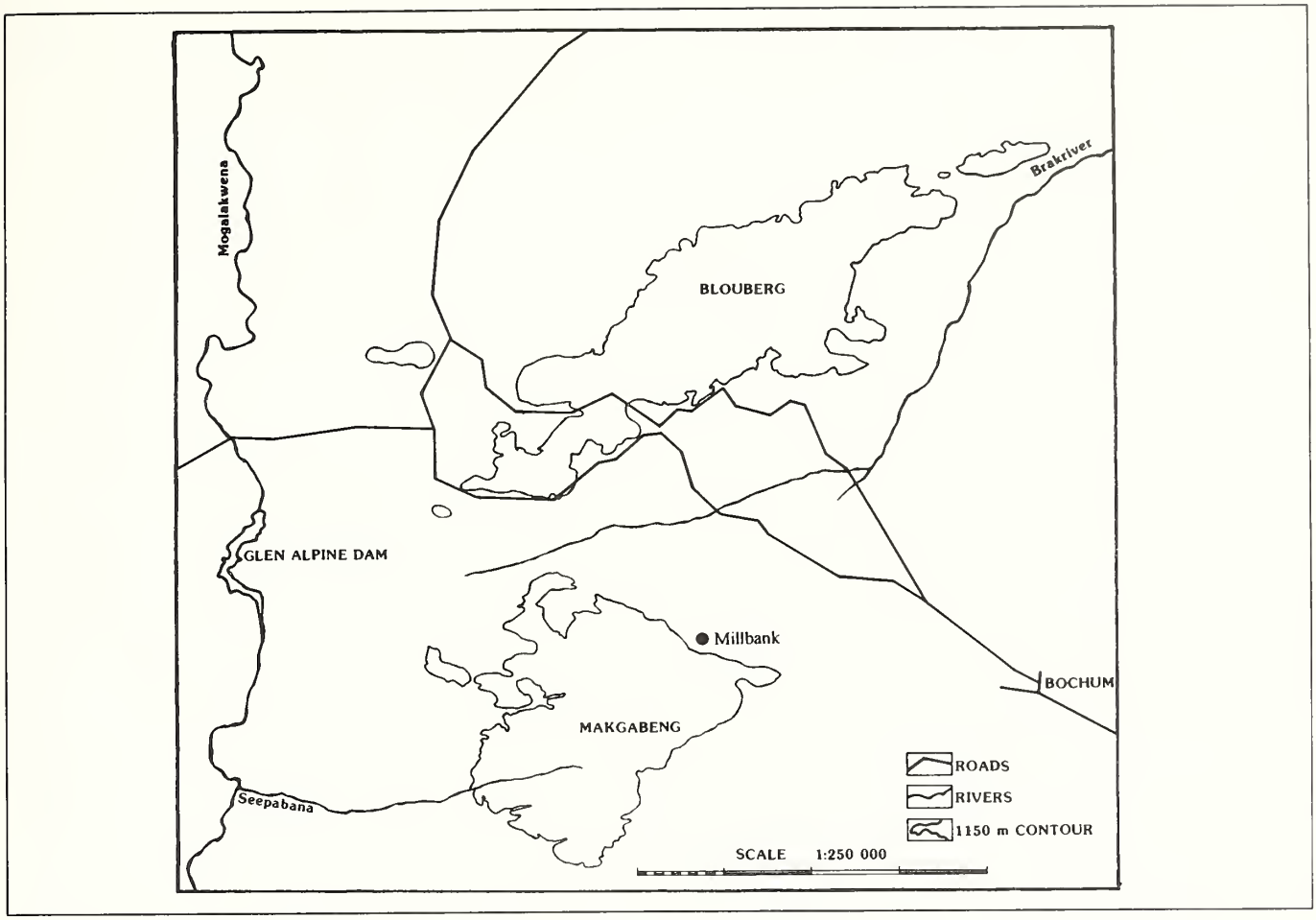

Fig. 2. Location of Millbank farm.

whorl, measuring 8 cm across, was found on the surface close to excavation 2.

Faunal remains

The identifiable faunal sample, though small, gives some interesting insight, especially if compared to other sites in the area. From the analysis, the inhabitants were mainly dependant on their domesticated animals (cattle, sheep and goats) for meat. According to the number of identifiable skeletal parts (NISP), adapted for skeletal complexity (QSP), *Bos taurus* occurs in greater numbers than *Ovis aries* and *Capra hircus* (Table 1).

Juvenile as well as mature animals were slaughtered (Table 2), with preference given to adults. The age distribution of *Ovis/Capra* indicated a majority of adults (Class V).

The relatively large numbers of cattle suggests that nagana (a parasite transferred by the tsetse fly and deadly for cattle) was absent at the time of occupation (Plug 1996).

Game species were also present: including *Alcelaphus buselaphus* (Red hartebeest), *Sylvicapra grimmia* (common duiker), *Aepyceros melampus* (impala), *Pelea capreolus* (grey rhebuck), *Hippotragus equinus* (roan antelope), *Oreotragus oreotragus* (klipspringer), *Damaliscus dorcas* (blesbuck), *Raphicerus campestris* (steenbuck) and *Redunca arundinum* (Reedbuck). These animals suggest the occupants hunted for additional meat.

The presence of large animals and herd animals like rhinoceros, zebra (*Equuus burchelli*), blue wildebeest (*Connochaetus taurinus*) and impala (*Aepyceros melampus*) indicate that men participated in community hunting. Small territorial buck, small carnivores, hares and birds were most probably caught with snares (Plug 1996).

Two pieces of bone that shows signs of having been worked, probably to be used as awls, were identified by the author and were not included in the faunal analysis.

Metal working and metal artefacts

A total of 26 pieces of metal was retrieved from the excavations, mostly from excavation 1. Most of these are, however, too fragmentary to determine use. Recognisable pieces include two spear blades, remains of two adzes, a piece of woven wire, probably used to cover the haft of a spear point as well as some sections of an arm band made by coiling a strip of metal around a core, probably of animal hair or other organic matter (Fig. 5).

Beads

Two glass cylinder type of beads were recovered from excavation 1: one small, yellow, 2,1 mm in diameter; other light blue, 5,0 mm in diameter. From excavation 5, came one cylinder bead, light yellow in colour, 7,0 mm in diameter and 9 mm in length, was recovered.

Table 1: Species present and basis of identification (D = deciduous; P = permanent; C = cranial; P-C = post cranial; SCF = shell, columella, fragment; O = other).

					TEETH		SKELETAL PARTS			
SPECIES	**NISP**	**QSP**	**MCI**	**MASS**	**D**	**P**	**C**	**P-C**	**SCF**	**O**
Canis mesomelas	1	1	1	9.9						
Panthera pardus	3	2	1	0.3		3				
Felis lybica	1	7	1	4.3			1			
Cf Rhinoceros	1	1	1	19.7			1			
Equus burchelli	1	1	1	45.9				1		
Procavia capensis	1		1	0.3				1		
Orycteropus afer	1		1	26.8				1		
Bos taurus	111	80	10	3128.6	8	25	19	59		
Cf *Bos taurus*	5	5		119.2		1		2		
Ovis aries	29	26	4	206.2		12		14		
Cf *Ovis aries*	1	1		8.7				1		
Capra hircus	35	28	2	257.1		20		6		
Ovis Capra	22	20	3	58.4	3	10		6		
BOV I	10	5		17.6				9		
BOV I non-domestic	3	1		8.01				2		
BOV II	9	4		44.61		1		8		
BOV II non-domestic	3	2		15.2				3		
BOV III definite	1	1		0.6				1		
BOV III	11	4		146				9		
BOV III non-domestic	3	3		77.1				3		
BOV I II	1			1				1		
BOV I II non-domestic	1	1		0.1		1				
Comochaetus taurinus	1	1	1	10.6				1		
Alcelaphus buselaphus	1	1	1	52.9				1		
Damaliscus dorcas	1	1	1	48.2				1		
Sylvicapra grimmia	3	3	1	7.7				2		
Oreotragus oreotragus	2	2	1	4.7				2		
Rhaphiceros campestris	1	1	1	0.01				1		
Aepyceros melampus	7	5	2	113.4				7		

Table 1. Continues.

Pelea campreolus	1	1	1	3.7				1		
Hippotragus equinus	1	1	1	101.6				1		
Cf *Hippotragus equinus*	1	1		35.7				1		
Redunca arundinum	1	1	1	4.2				1		
Small sized rodent	4	4	1	0.2		2	2			
Mouse sized rodents	18	15	1	1.67		3	1	14		
Rat sized rodents	30	21	1	1.25		3	1	7		
Mole sized rodents	1	1	1	0.3				1		
Lepus saxatilus	1	1	1	1.6				1		
Lagamorph	1	1		0.1				1		
Gallus domesticus	1	1	1	0.1				1		
Struthio camelus	4			0.31						4
Very small bird	1		1	0.1				1		
Medium sized bird	3	2	1	0.31				3		
Geochelene pardalis	24	24	1	34.8					7	
Tortoise	4			1.6				3	1	
Bufo rana	1	4	1	0.1				1		
Achatina zebra	1	1	1	0.9					1	
Achatina sp.	10	34	1	38.8				8	1	1
Aspatharia sp.	1	1	1	4.5					1	
Unionidae	3	3	1	1					2	
TOTAL	376	325	50	4666	11	82	41	187	13	5

One string containing 37 (small: 3,0 mm; large: 5,0 mm; SSD: 0.3634 mm; AM: 4.08 mm) ostrich eggshell beads were found. Although these beads stuck together, no trace remained of the original material on which they were strung. Another 20 individual beads in the collection ranged in size from the smallest 3,0 mm to 10,0 mm for the largest (SSD: 2.7925 mm; AM: 7,115 mm).

Worked stone

One spatulate-shaped object, made from a slate like material, was found in excavation 1. It is 55 mm wide and 75 mm in length up to the point where it was broken off at the back. When complete, the object probably was triangular in shape, with the short side of the triangle somewhat rounded. Its function is difficult to determine as the rear section is missing, but it could have been used as some kind of spoon, or to smooth pots with.

DATING

The following dates were obtained.

TM3/1

Layer 2 (Pta-7471): 270 ± 45 - 1649(1663)1675; 1772-1800 AD

Layer 5 (Pta-7473): 260 ± 50 - 1651(1666)1680; 1775-1804 AD

Layer 7 (Pta-7465): 385 ± 20 - 1503(1517)1528; 1554(1579)1601; 1614(1626)1633 AD

TM3/5

Layer 1 (Pta-7476): 180 ± 45 - 1675(1689,1733)1772; 1800(1813)1886 AD.

Table 2: Age determination based on tooth wear

Bos taurus		Ovis/Capra	
Age class	NISP/MNI	Age class	NISP/MNI
I		I	
II	8/2	II	7/2
II/III	2/1	III	
III	1/1	IV	6/2
III/IV	2/1	V	28/2
IV	1/1	VI	3/2
V			
VI			
VII	1/1		
VII/VIII	1/1		
VIII	7/1		
IX	5/1		
Total	28/10	Total	44/8

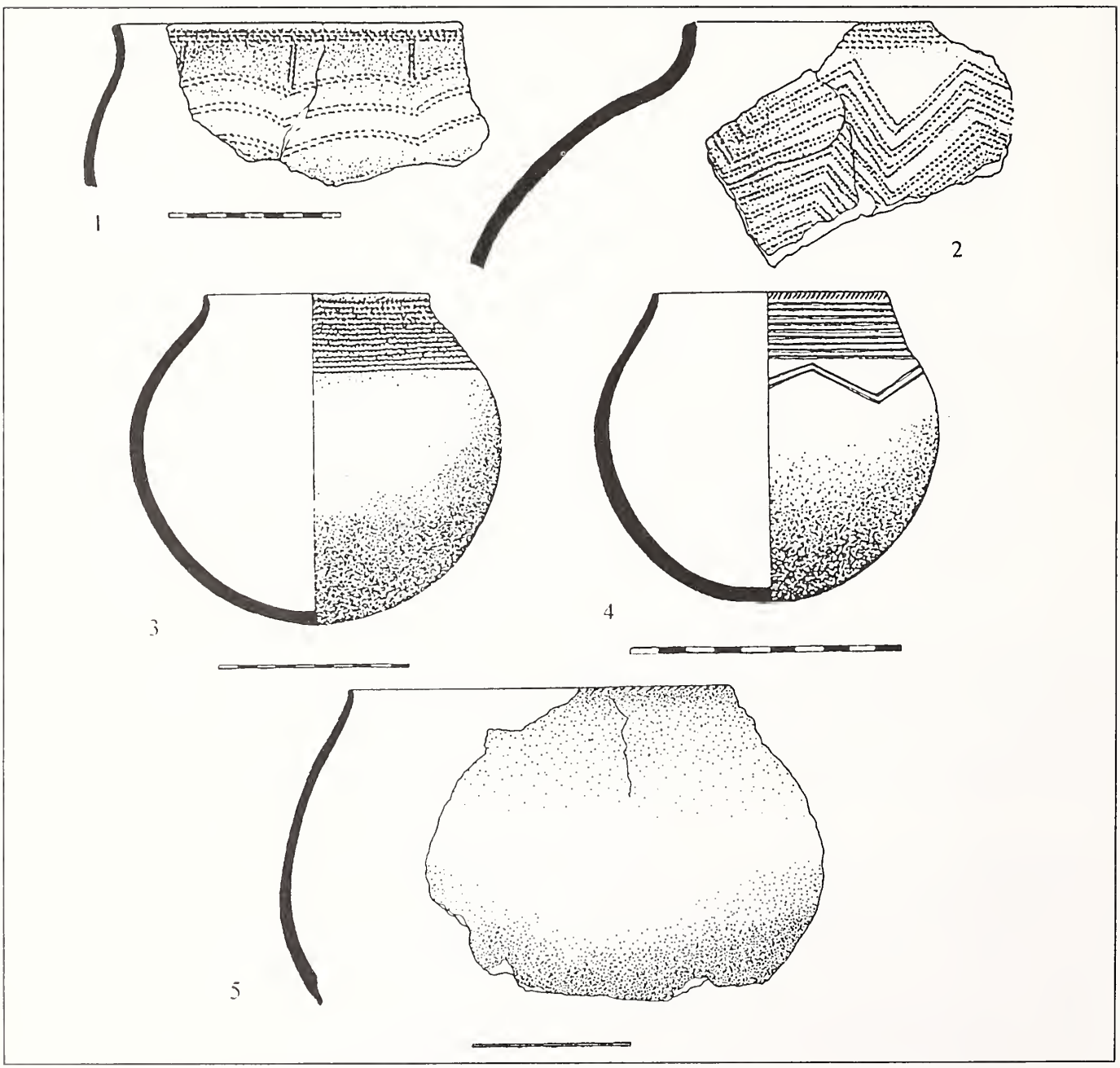

Fig. 3: Ceramic classes fromMilbank: class 1: 1 & 2; class 2: 5; class 3: 3; class 4: 4.

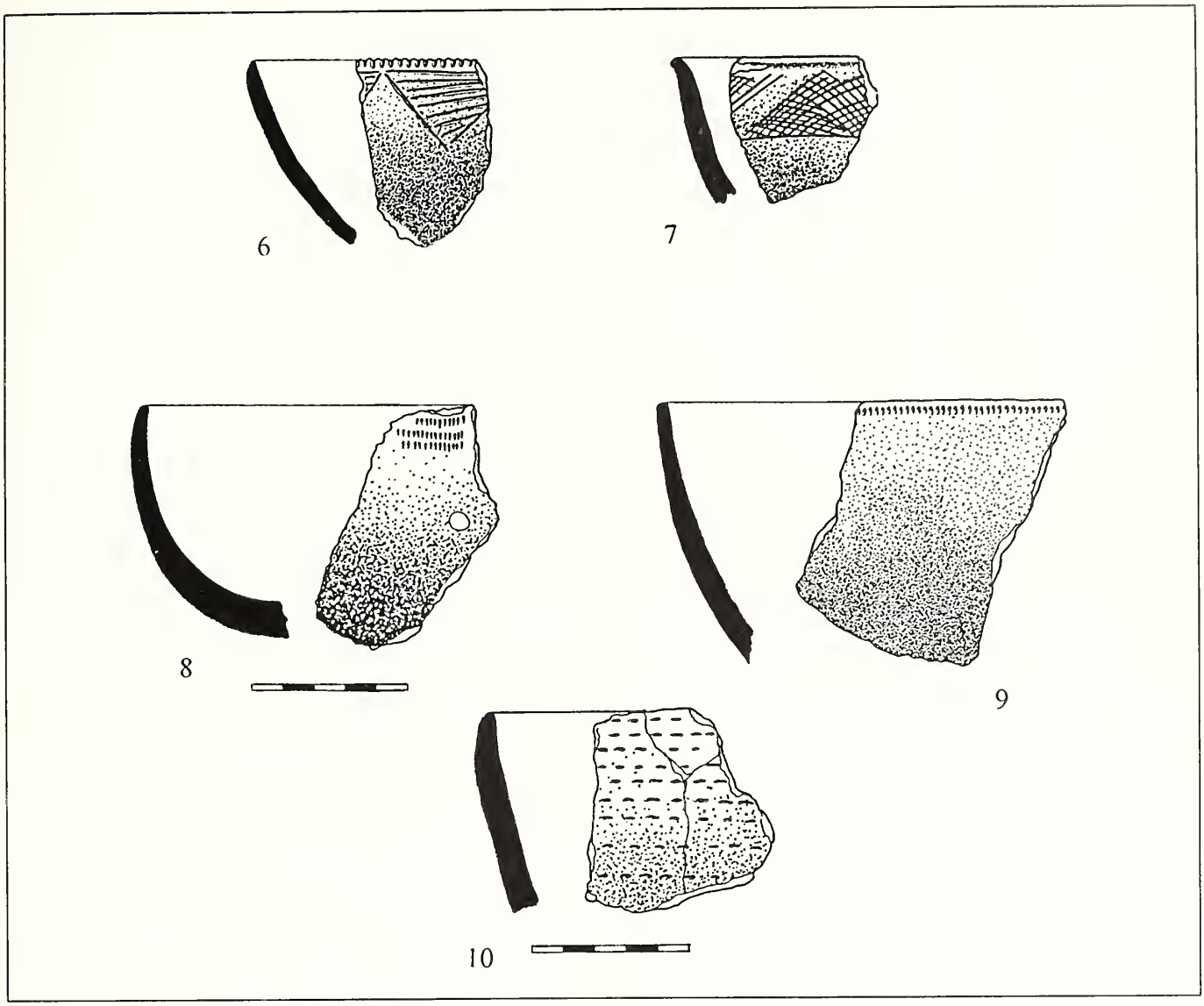

Fig. 4:. Ceramic classes from Millbank: Class 5: 7, 8 &10; class 6: 6; class 7: 9.

DISCUSSION

The pottery recovered at Millbank is distinctive enough to place it within the Moloko cluster, more specifically in the Letsibogo phase, first described in Botswana (Huffman pers. comm; Campbell, Kinahan & Van Waarden 1996). Unfortunately, not enough information has been published on the material recovered from the Letsibogo site to make further comparisons possible.

The material found at Millbank, *ie.* pottery and metal objects, show broad similarity to Hall's RU-4 material in the Rooiberg area to the south (Hall 1985). Although the pottery is similar, there are also variations. Chief amongst this is the absence of certain classes. Some of this can be ascribed to the smallness of the Millbank sample. However, rim nicking, described by Hall (1985:198) as an integral part of pottery decoration on the hill top mode sites, is well represented in the Millbank assemblage.

The dating of TM3 is also well within the range of Hall's date of AD 1670 for Rooikrans hill-top site 131/78 (Hall 1985:144) and AD 1640 for Renosterkloof valley floor site 101/78 (Hall 1985:179). This correspondence in dating is also noticeable with the Letsibogo material (Campbell, Kinahan & Van Waarden 1996).

However, in contrast to the sites in the Waterberg, only a small amount of stone walling is found at Millbank and even less at a second, later site located 40 km to the north west at Randjies (Van Schalkwyk 1994). The more extensive walling at Millbank, it seems, can be related to Venda settlement in the area. Differentiating between the two sets was solved when walling associated with ash middens were found with pottery belonging to the Moloko cluster.

Furthermore, there is, similar to what Hall (1985) found, a marked absence of glass beads at Millbank, in contrast to Randjies where it was found in relative abundance.

The faunal assemblage indicates that more domestic animals featured in the diet of the people here than at Randjies. In the latter case, the opposite was found. At Randjies very little domestic animals were identified (Plug 1994). Two possible reasons exist. The latter site is closer

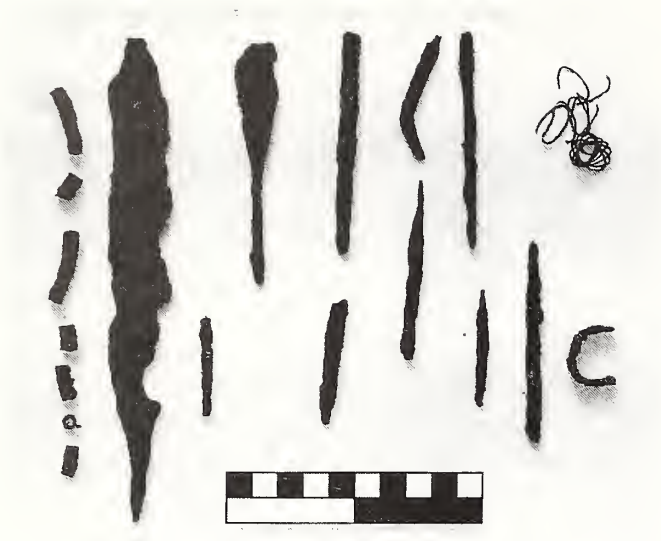

Fig. 5. Metal artifacts from Millbank.

to the river, with nagana a bigger option, making the keeping of cattle difficult. Secondly, cultural practices such as the *mafisa* practice, which prohibit people from slaughtering and eating cattle. Historical evidence (Van Warmelo 1953) and oral tradition indicates that this practice was applied quite extensively in the area of Randjies. According to this practice, people lacking their own cattle would look after those of other people in return for used of produces such as milk or a certain amount of the natural increase of the cattle.

Evers (1988:127) see a movement for Moloko from northeast (Transvaal), with a date of about 1300, to southwest (Transvaal) where the dates range from the fifteenth to the seventeenth centuries. He sees sites in the north and west as not Moloko, as the styles in this area were derived from either Gokomere or the Kalundu tradition. However, Icon (Hanisch 1979), a Moloko site in the north, develops into Letsibogo (Huffman pers. com.), yet another Moloko site in the north. Sites such as Millbank therefore confirm the distribution of Moloko outside the area indicated by Evers.

ACKNOWLEDGEMENTS

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RESULTS FROM TWO TEST EXCAVATIONS IN THE BAVIAANSKLOOF MOUNTAINS, EASTERN CAPE PROVINCE

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ABSTRACT

This paper reports the results from two test excavations conducted during the early 1980s in the Baviaanskloof River valley, Eastern Cape Province. Both sites, Rautenbach's Cave (RC) and Nuwekloof Shelter (NK) yielded well-preserved botanical remains, storage pits and other lined hollows dating within the last ca 2000 years BP.

INTRODUCTION

Rautenbach's Cave and Nuwekloof Shelter were two of several small caves and shelters test excavated during the early 1980s in the Baviaanskloof /Kouga Mountain ranges in the south-eastern Cape region (Fig. 1). As discussed elsewhere, the aim of the project was to investigate the socio-economic strategies and settlement patterns during the Holocene Later Stone Age for this region. The project proposal, results from other sites and the present day environment have been discussed elsewhere (see Binneman 1997, 1998, 1999). The detailed site analysis will be published at a later stage.

RAUTENBACH'S CAVE

Rautenbach's Cave is situated some 150 m above the entrance to Houtkloof on the original farm Rietrivier (known as Rautplaas in the 1980s) (33.31S; 23.42E) (Figs 2 & 3). The cave was named after the owner of the farm by a certain Dr Jolly from Cape Town who was permitted to excavate the site during the 1960s.

Access to the cave is difficult and a very steep cliff must be negotiated to gain entrance.The cave faces north-east and has an almost triangular opening which was formed by natural weathering along an intrusion contact between Witteberg quartzites and shale (Deacon & Brooker 1976). The cave is 8 m wide, 10 m deep and some 8 m high at the entrance (Fig. 4). A large area of the cave floor was disturbed by the Jolly excavations and other digging between the 1960s and 1982. A few buckets of the dug-out material were sieved and sampled.There are still a few paintings visible on the southern wall.

EXCAVATION AND DATING

It was estimated from the Jolly excavation that the archaeological deposits at Rautenbach's Cave were between 1-2 m deep. A radiocarbon date of 12 560 ± 100 BP (Pta-251) was obtained for the bottom layers of the deposit (Deacon & Brooker 1976). Unfortunately, due to circumstances outside my control, it was only possible to excavate the top well-preserved plant remains (refered to as bedding in the text) of one square metre next to the side wall. The bottom of the plant remains rested on grey ashy deposits and was dated to 1620 ± 40 BP (Pta-4611).

The plant rich unit was between 15-20 cm thick and consisted of a series of shallow plant filled hollows and patches of burnt bedding. Some of these shallow depressions were partly lined with *Boophane disticha* leaves. Unfortunately parts of the deposit have been disturbed by rodent activities.

Underlying the surface dust and roof rubble, were several circular and semi-circular hollows loosely filled with soil, plant material and charcoal. One hollow was filled with a thick, compacted accumulation of grass and other plant remains. A small area of one of the hollows was still lined with *Boophane disticha* leaves. Patches of burnt bedding, grey ashy soils and rodent disturbances accounted for a large part of the excavated area. (Fig. 5).

The removal of the surface material revealed more shallow hollows filled with well-preserved compacted grass and other plant remains, a red ochre and *Boophane disticha* lined floor and rodent disturbances (Fig 6). After the rodent disturbances were cleaned the red ochre and *Boophane disticha* lined floor extended over a large part of the square (Figs 7 & 8). This feature probably

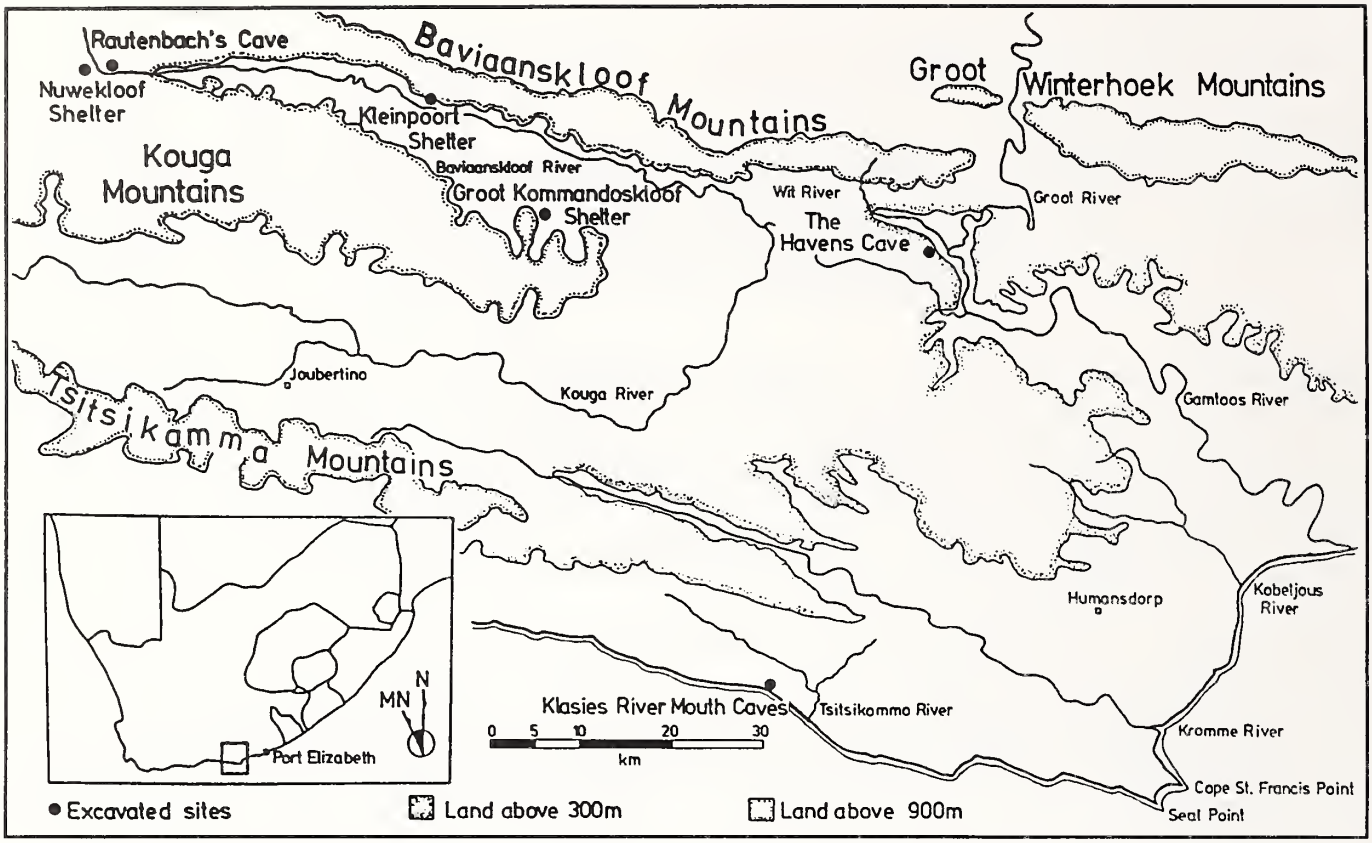

Fig 1. Map of the south-eastern Cape, the location of Rautenbach's Cave, Nuwekloof Shelter and other sites mentioned in the text.

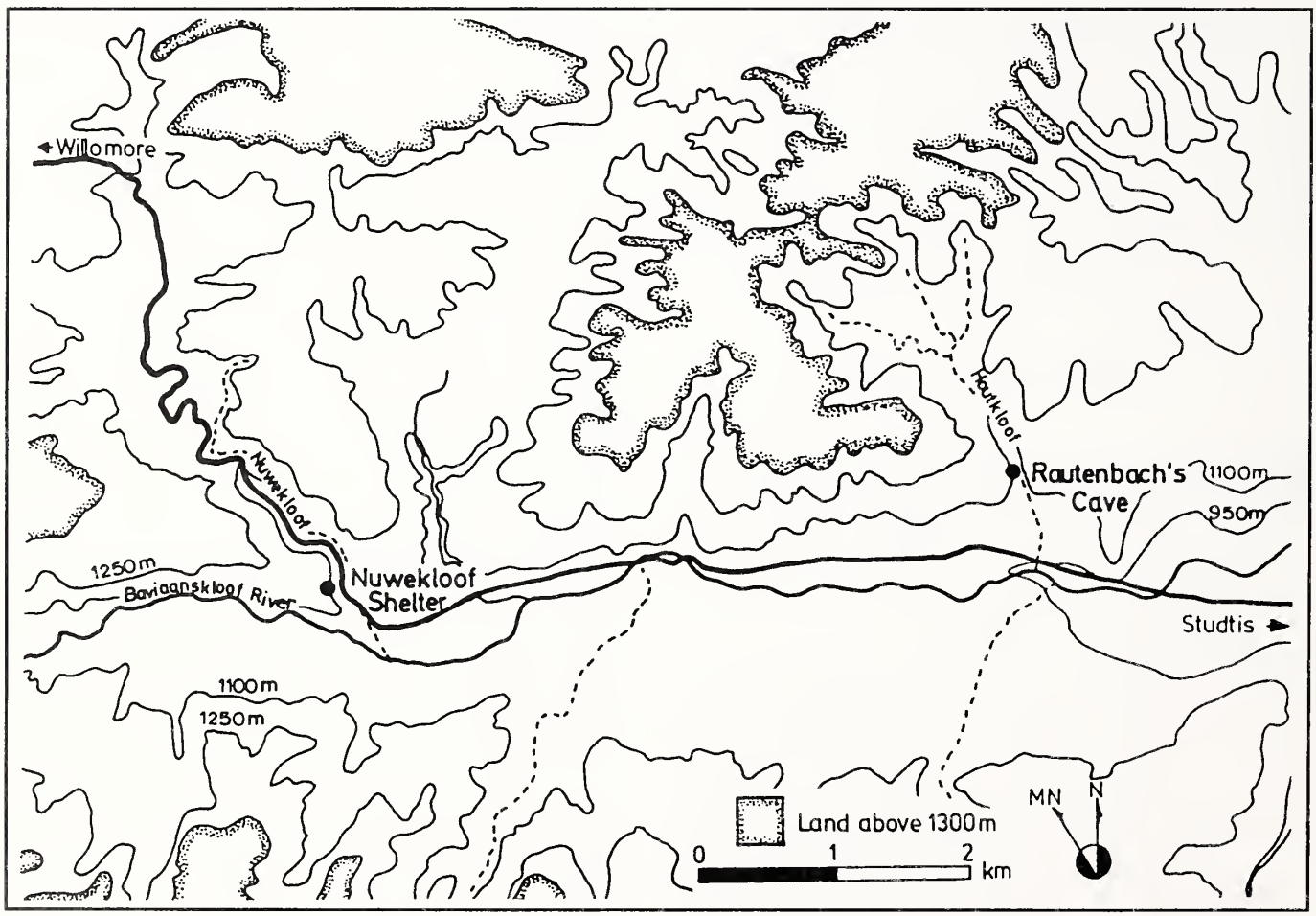

Fig. 2. Location of Rautenbach's Cave and Nuwekloof Shelter.

Fig. 3. View of Rautenbach's Cave.

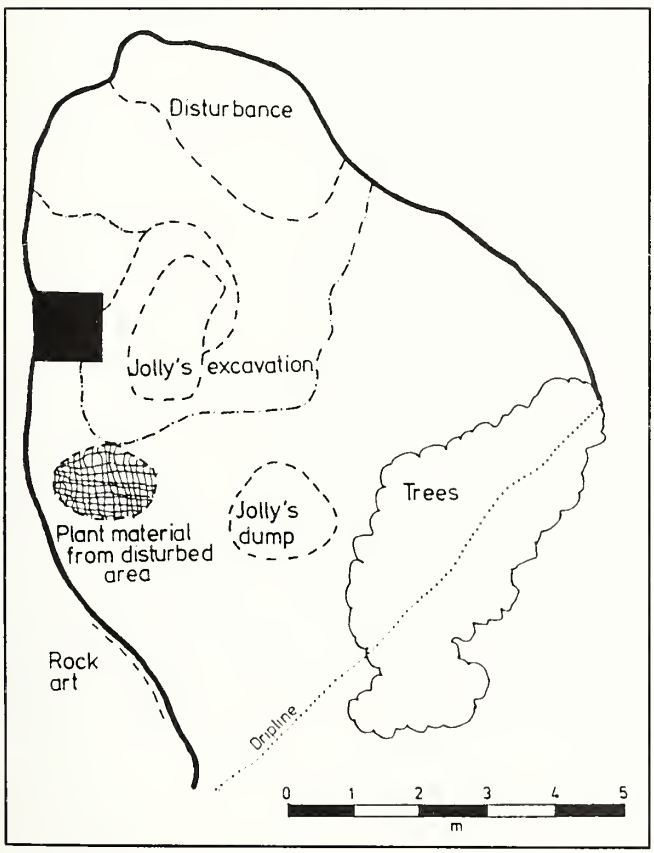

Fig. 4. Plan and location of the excavation at Rautenbach's Cave.

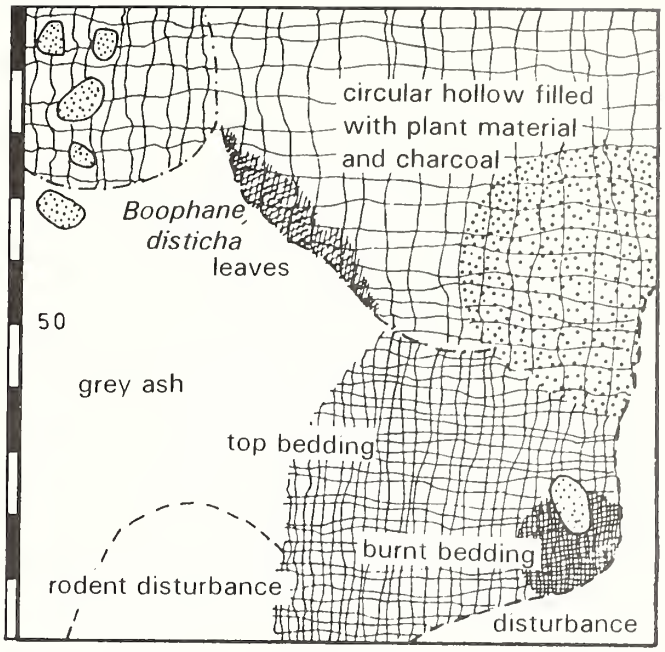

Fig. 5. Plan of the sub-surface bedding hollows, other features and rodent disturbances..

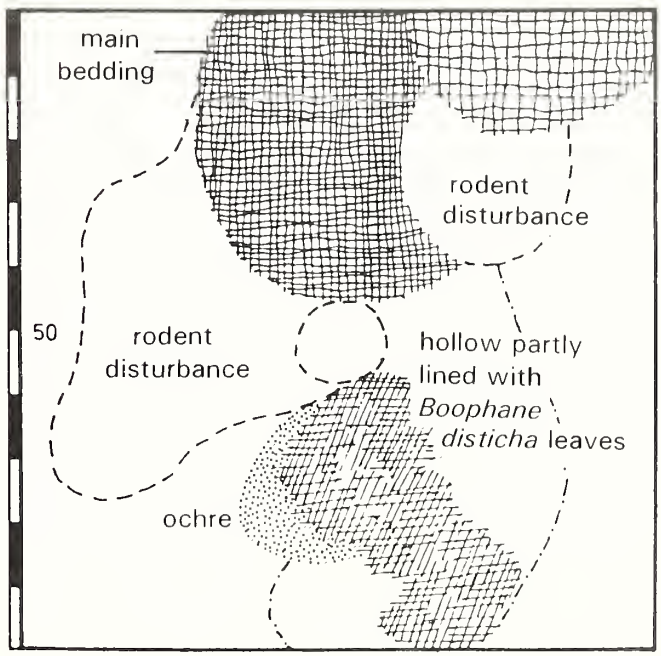

Fig. 6. Plan of the Bedding hollows, ochre and *Boophane disticha* lined floor and rodent disturbances.

represents a burial hollow because two parietal bones of a human skull were found next to the lined floor (Fig. 9). Some marine shell, a *Turbo sarmaticus 'button', Nassarius kraussianus* and OES beads were also found in the feature and may have been part of the initial grave goods (Fig. 10). Strangely enough, the hollow did not yield any other skeletal remains. It is possible that these were probably removed by rodents. The bottom of the feature yielded vast amounts of charcoal, which also raised some unanswered questions. Next to the lined *Boophane disticha* hollow was another shallow hollow filled with the remains of a large mountain tortoise (Fig. 11).

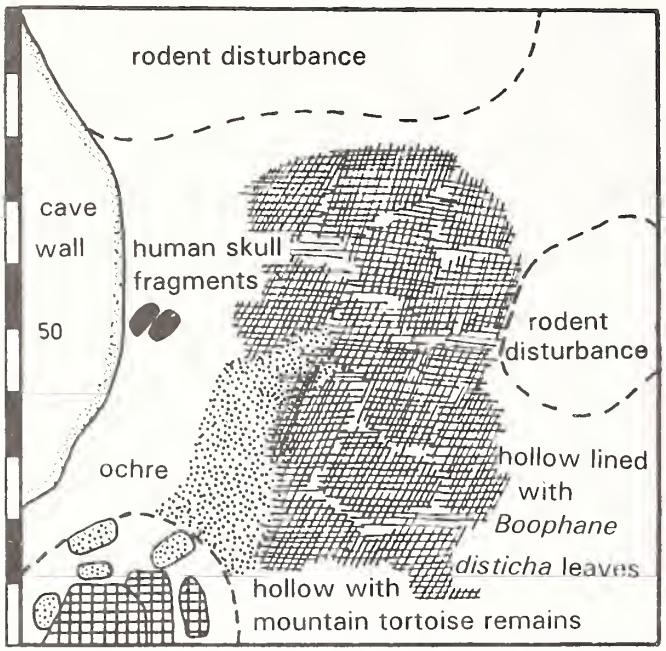

Fig. 7. Plan of the ochre and *Boophane disticha* lined floor, 'disturbed burial hollow'(?), mountain tortoise hollow and rodent disturbances.

Fig. 8. Part of the ochre and *Boophane disticha* floor.

SUBSISTENCE AND DIET

Botanical remains

In general the plant remains recovered from Rautenbach's Cave were similar to those found at other excavated sites in the region (Table 1). The bulk of the well-preserved botanical remains consisted of grasses, sticks, twigs and bark. Mixed with these remains were knotted plant bunches, 'grass plugs' (Fig. 12), botanical artefacts, lithic and non-lithic artefacts, marine shell and mammal bone remains.

Relatively large quantities of *Cyperus usitatus* corm tunics were recovered from the test excavation. Other underground species such as *Watsonia* sp and *Freezia* sp.

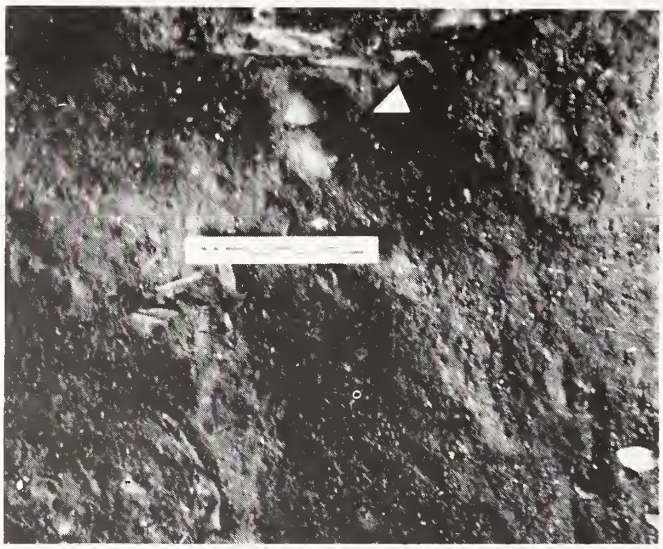

Fig. 9. Human skull remains next to the cave wall.

Fig. 10. Insert: A *Turbo sarmaticus* 'button' from Rautenbach's Cave, found on the *Boophane disticha* lined floor near the human skull fragments. It is similar in size and shape to those found with a juvenile burial at Klasies River Cave 5 (AM HS 297)(main figure).

Table 1. Analysis of bulk samples of botanical remains and other inclusions from Rautenbach's Cave and Nuwekloof Shelter.

	RC	NK		RC	NK
WEIGHT					
Unsieved	3452,8	4662,2	**SEEDS AND FRUITS**		
1mm mesh	1496,6	2800,8	*Schotia* sp.pods	0,2	
3mm mesh	410,1	1744,4	*Pappea capensis*	0,3	0,8
			Olea Capensis	0,5	0,3
NON BOTANICAL			*Euclea* sp.	0,1	0,2
Waste stone	112,6	2,8	*Grewia occidentalis*		*
Stone tools	5,5	0,2	*Hypodiscus aristatus*		0,1
Pottery	34,4	0,9	*Cissampelos capensis*	*	
OES	0,1	0,7	*Diospyros* sp.	*	
Bone	4,2	6,6	*Rhus* sp.	*	0,2
Insects	*	0,1	Misc. Unidentified		0,7
Coprolites	4,1				
Earth lumps	65,6	75.9	**EDIBLE AND MEDICINAL**		
			Watsonia sp.		
PROCESSED PLANT MATERIAL			corm tunics	*	
REEDS			corm bases	0,3	
fragments		0,2	*Freezia/Tritonia* sp.		
			corm tunics	0,3	7,1
CYPERUS TEXTILIS			corm bases	0,3	6,8
matting	0,8		*Cyperus usitatus*	5,5	*
fragments	0,5	0,2	*Grassula/Cotyledon* sp.	0,3	3,3
			Boophane disticha	*	0,8
WOODEN ARTEFACTS					
linkshafts	1.9		**LEAVES**	1,3	15,6
utilized	0,4				
shavings	12,6	6,5	**OTHER INCLUSIONS**		
			Charcoal	24,0	8,9
GRASSES			Twigs and bark	35,9	32,5
stems and bases	154,5	64,8	*Pelargonium* sp.	0,3	
			Dodonacaea viscosa	*	
INFLORECENCES			*Lamiaceae/verbenaceae*	1,0	0,3
Themeda triandra	*	0,2	Fern	*	
cf. Stipa sp.	*	0,1			
cf. Eragostis sp.		*	**BOTANICAL ARTEFACTS**		
Cyperus sp.	*		Plant bunches	4,7	
Helicrysum sp.	*	*			
Restio sp.		*			

* Present

Fig. 11. A shallow hollow filled with remains of a large mountain tortoise.

were also present in very small quantities. *Moraea* sp.and *Dioscorea elephantipes (elephant's foot)* whi wech were recorded at others sites in the region was absent from the samples.

The only new inclusion was *Grassula* cf. *ovata* ('plakkie' family). This plant was widely used by European settlers and Bantu-speaking people. The fresh juice can be used to treat epilepsy (Pappe 1868:16). The fleshy parts of the leaves were used by Europeans settlers and Xhosa to soften corns. Xhosa also use the warmed leaf juice as ear and toothache drops. The Zulu and Swazi use a decoction as an enema in syphilis.

Faunal remains

The mammal remains were dominated by mainly small animals such as dassie, hare, duiker, klipspringer and grysbok (Table 2). However, the occasional eland and mountain zebra captured, indicate that the bulk of the meat was obtained by hunting rather than by trapping.

Fig. 12. Knotted plant bunch and grass 'plugs'.

Table 2 Faunal remains from Rautenbach's Cave and Nuwekloof Shelter.

	RC	NK
MAMMALS		
Papio ursinus	2	1
Small carnivore	1	1
Procavia capensis	15	8
Equus cf zebra	1	
Raphicerus melanotis	1	1
Raphicerus sp.	5	1
Taurotragus oryx	1	
Sylvicapra grimmia	2	2
Oreotragus oreotragus	2	
Lepus sp.		2
Bovidae - general		
small	2	1
small medium	3	1
large medium	2	3
TOTAL	37	21
REPTILES (tortoise)	*	*
Other reptiles	*	*
MARINE SHELL		
Perna perna	4	
Bullia digitalis		1
Turbo sarmaticus	1	
Tricolia capensis		
Oxystele sp.	2	
TOTAL	7	1

* Present

Shell remains

No *U. caffer* was found at Rautenbach's Cave, but marine shell such as *Perna perna*, *Oxystele sinensis*, *Oxystele tigrina* and *Turbo sarmaticus* were recovered (Tabel 2). These were probably returned to the site for ornamental use.

CULTURAL REMAINS

Lithic artefacts

Only a small number of formal stone tools were recovered from the bedding units (Table 3). These included five scrapers (one with mastic and one ochre stained) and two adzes. The majority of the stone artefacts were untrimmed flakes manufactured of quartz and quartzite.

It is interesting to note that all the formal tools were manufactured of chalcedony, silcrete and hornfels. It may be speculated that quartz, which was the preferred raw material for formal tools at two other sites in the region, was ignored in favour of these raw materials. However, only larger samples will reveal if this was indeed the case.

A relatively large number of red ochre fragments were also recovered from the excavation.

Non-lithic artefacts

Only a few botanical artefacts were recovered, including three wooden link shafts, *Cyperus textilis* matting and netting, some worked wood, mastic, a female fire drill, some plant bunches and a large quantity of wood shavings (Table 4) (Figs 13). A fair number of potsherds (63) were found, including four rim pieces and one decorated piece. A small lump of modeled clay was also recovered Fig.14). Fingerprints are visible under low magnification.

The small excavation yielded a relatively large number of OES beads and fragments. Some marine shell, a *Turbo sarmaticus* 'button' and two *Nassarius kraussianus* beads were also found, together with bone beads, shavings and flakes (Table 5).

Table 3. Frequencies of stone artefacts from Rautenbach's Cave and Nuwekloof Shelter.

	RC	NK
WASTE		
Chips		
Quartz	23	
Quartzite	2	3
Chalcedony	3	
Hornfels	1	
Chunks		
Quartz	3	
small cores		
Quartz	1	
Core reduced pieces		
Quartz	1	1
Chalcedony	1	
Flakes		
Quartz	21	5
Quartzite	28	18
Silcrete	6	
Chalcedony	11	
Hornfels	5	
TOTAL	**106**	**27**
UTILISED		
Flakes		
Quartzite		1
Silcrete		1
Chalcedony	1	
Hornfels		1
TOTAL	**1**	**3**
FORMAL		
Scrapers		
Silcrete	1	
Chalcedony	1#	1
Hornfels	2+	
Adzes		
Silcrete	2	
TOTAL	**6**	**1**
OTHER INCLUSIONS		
Ochre	30	22
Shale		1

+ Ochre stained # Mastic

DISCUSSION

It is difficult to draw comprehensive conclusions from the small excavation and samples, especially since a large part has been disturbed by rodent activities. Nevertheless, the remains provide an insight into the possible socio-economic patterns which were operating at Rautenbach's Cave.

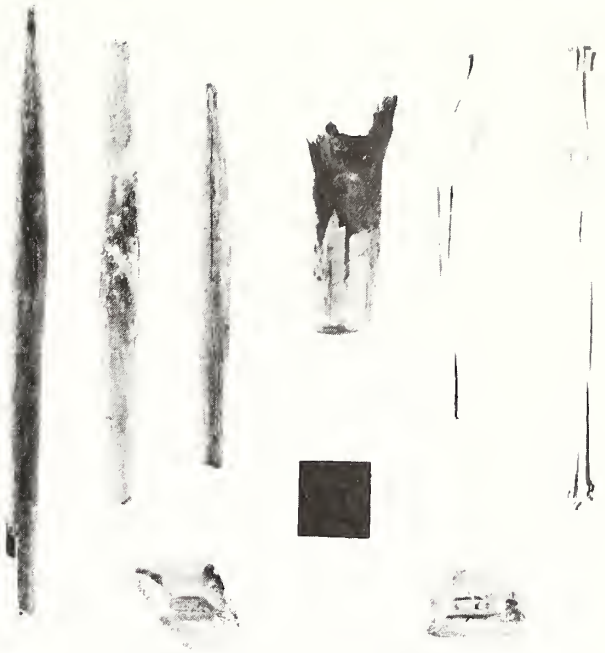

Fig. 13. Botanical artefacts from Rautenbach's Cave: 1. wooden link shafts; 2. cut wood; 3. matting; 4. fire drills.

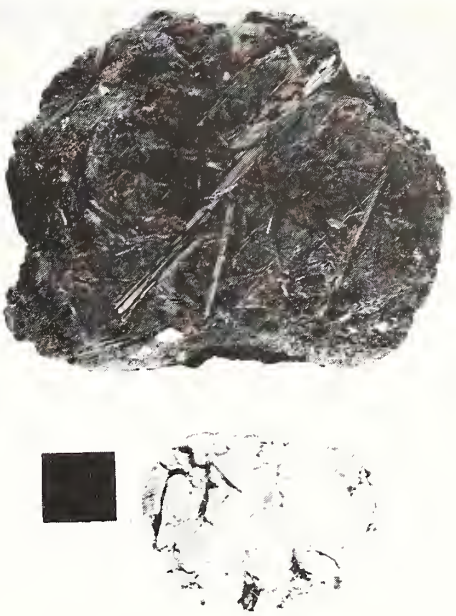

Fig. 14. A large piece of mastic and a small lump of modeled clay from Rautenbach's Cabve.

The underground plant food remains recovered, especially the relatively large quantities of *Cyperus usitatus* (and absence of for example *i.e. Watsonia* sp), suggests a similar pattern to that observed at Kleinpoort Shelter (Binneman 1998), *i.e.* short visits by small family groups to exploit this abundant small food package (patch hopping strategy).

However, on the other hand, the occupation features, such as the red ochre and *Boophane disticha* lined hollows, and associated cultural remains suggest that the cave may have been used for specialized activities. The

Table 4. Frequencies of pottery, leather and botanical artefacts from Rautenbach's Cave and Nuwekloof Shelter.

	RC	NK
POTTERY		
Fragments	58	36
Rim	4	
R/decoration		1
B/decoration	1	1
TOTAL	**63**	**38**
LEATHER		
Fragments	1	2
WOOD		
Points		1
Pegs		1
Linkshafts	3	
Fire drills		
male		2
female	4	
Cut pieces	2	13
Utilized pieces	1	
Shavings	*	*
TOTAL	**10**	**17**
REED		
Arrowshafts		
Cut/notched	1	2
TOTAL	**1**	**2**
CYPERUS		
Cordage		1
Matting	11	12
Netting	2	2
Cut/slit	2	14
TOTAL	**15**	**29**
SEED BEADS		
H. aristatus		4
OTHER ARTEFACTS		
Plant bunches	4	
Bark knots		1
TOTAL	**4**	**1**
OTHER INCLUSIONS		
Mastic	1	1
Clay	1	
Feathers		1
Glass beads		1
TOTAL	**2**	**3**

Table 5. Frequencies of shell, worked shell and bone artefacts from Rautenbach's Cave and Nuwekloof Shelter.

	RC	NK
OSTRICH EGGSHELL		
Fragments	33	11
Roughouts	4	1
Beads	18	33
TOTAL	**55**	**45**
WORKED MARINE SHELL		
Nassarius kraussianus beads	2	
Turbo sarmaticus 'button'		
TOTAL	**2**	
MARINE SHELL	4	
Perna perna		1
Bullia digitalis	1	
Turbo sarmaticus	2	
Oxystele sp.		
TOTAL	**7**	**1**
BONE		1
Tortoise bowls		1
Points		1
linkshafts	3	2
Beads	1	1
Flakes	1	
Shavings		1
Ochre stained		1
Utilised		
TOTAL	**5**	**8**

formal stone tools, ostrich eggshell beads and roughouts may indicate that the site was the focus of important group social and manufacturing activities during the warmer months of the year. The lump of modeled clay was an interesting find and it may suggest that pot-making activities took place at the site, which may also explain the charcoal filled hollow.

It would appear that the one-to-one scenario of small plant food packetages equals small mobile groups, as assumed from the Kleinpoort data, do not fit the Rautenbach's Cave evidence. Therefore it may be possible that there were several strategies at work during the past 2000 years in this part of the Cape mountains .

When the data from Rautenbach's Cave is compared with those from other sites in the region it suggests that larger family groups (at least larger than at Kleinpoort Shelter) stayed for limited periods at Rautenbach's Cave and practiced social activities usually identified with aggregation. Stays at the site were determined by the length of time *Cyperus usitatus* and other food packages along the valley floor could support these groups.

This would suggest that Rautenbach's Cave was used for short periods (a few weeks) during the *Cyperus usitatus* season for aggregation. It is possible that there were several of these 'short period' aggregation sites throughout the region. Whatever the case may be, at least it is evident that populations in this region were not depended on large food packages such as *Watsonia sp.* for aggregation.

NUWEKLOOF SHELTER

Nuwekloof Shelter (33.31S; 23.39E) is situated some five kilometres west of Rautenbach's Cave in the Nuwekloof Pass on the farm Nieuwe Kloof (Fig. 1 & 2). This large shelter faces north-east and is located in Witteberg quartzites some 20 m above the valley floor (Fig. 15). The shelter is 20 m wide, 10 m deep and the roof some 10 m high at the drip line (Fig. 16 & 17).

A one square metre test excavation was conducted next to a man-made disturbance. The deposit, which contains well-preserved botanical remains, was 0,30 m deep with a storage pit reaching down to 0,60 m (Fig. 18). The floor of the shelter slopes steeply towards the front and most of the occupational deposit and plant material were located on a 'step' along the back wall.

STRATIGRAPHY AND DATING

The somewhat strange appearance of the different occupation layers was due to a large storage pit found at the bottom of the sequence. A large pit, 0,50 m in diameter and 0,50 m deep was dug into the floor rubble (Fig. 18).

The stony soil from the pit left on the surface after the pit was sealed, caused later built-up of occupation deposits to followed the natural contours of the obstruction.

The pit was lined with a thick layer of grass and the opening was closed with a 'grass plug', indicating that the occupants never returned or opened the pit and utilized the contents (Figs 19, 20 & 21). The pit was filled with thousands of *Pappea capensis* seeds and floor debris (Fig. 22). Although storage pits were also reported from other sites in the region (The Havens Cave and Kleinpoort Shelter), this was the first one found with its contents still intact in. Charcoal from the pit was dated to 1140 $\pm$ 50 BP (Pta-4617).

Overlying the sealed pit was a stony deposit with patches of plant material, but not as compacted as the overlying bedding layers. Most of the deposit consisted of grey ash (BH) and a large fire place with abundant large chunks of charcoal in the one corner of the square (BH/AF). Several fire cracked stones were found inside the fire place (Fig. 23).

BH was overlain by a yellow gritty soil (YSB). The only important find from this layer was a *Chesine angulata* carapace used as a bowl (Fig. 24). The inside of the carapace showed numerous scratches and smooth polished edges.

Fig. 15. View of Nuwekloof Shelter.

Fig. 16. A view of the inside of Nuwekloof Shelter.

Overlying YSB was a thick, compacted accumulation of plant material (mainly grass), divided into main bedding (MB) and top bedding (TB).

SUBSISTENCE AND DIET

Botanical remains

The bulk of the botanical remains at Nuwekloof Shelter comprised of grasses, twigs, sticks, leaves and bark. *Themeda triandra* ("rooigras"/red grass) was the most common grass identify from the inflorescence.In general the remains are similar to the nearby Rautenbach's Cave and other sites in the region.

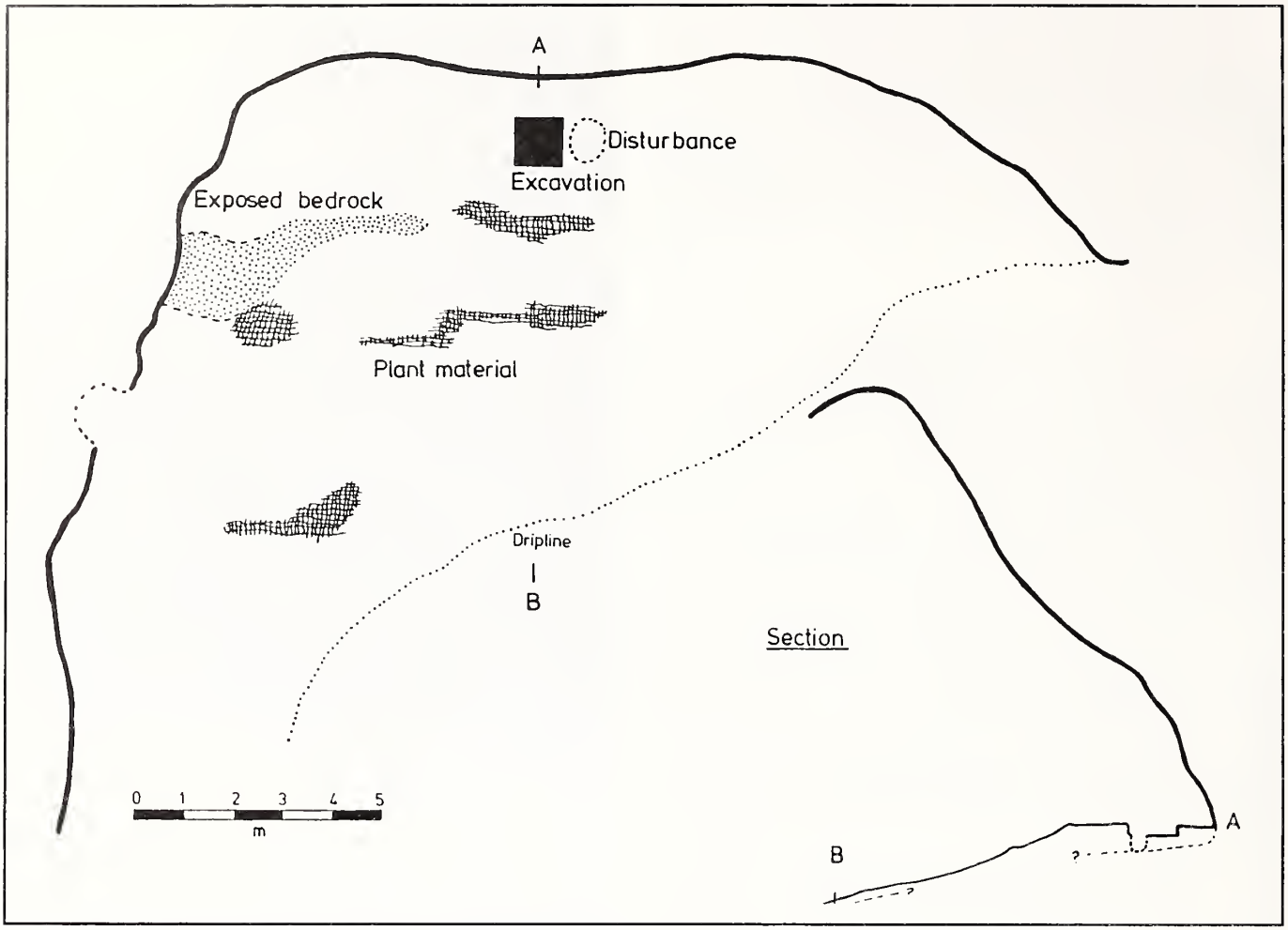

Fig. 17. Plan and excavation at Nuwekloof Shelter.

Freezia sp. was the most abundant underground plant food remains in all the layers. *Cyperus usitatus* was virtually absent from the samples and only a small quantity was recovered from the top bedding. Other geophytes such as *Watsonia* sp. and *Moraea* sp. were absent from Nuwekloof Shelter.

Seeds remains were similar to those from other sites in the region. *Schotia* sp., however was absent, as well as *Dioscorea elephantipes*. A large amount of *Crassula* cf. *ovata* stems and *Cotyledon* cf. *orbiculata* (pig's ears) flowers were recovered, which may be blown in from a dense stand of these plants at the entrance to the cave and on the hill side. Both have medicinal uses among Bantu-speaking people.

Faunal remains

The mammal remains recovered from Nuwekloof Shelter were mainly those of small territorial animals such as hare, dassie, grysbok and duiker. This suggests that trapping rather than hunting supplied the bulk of the meat. (Table 2).

Shell remains

No freshwater shell remains were recovered from the excavation and only one fragment of marine shell, *Bullia digitalis* was found.

CULTURAL REMAINS

Lithic artefacts

Little can be said about the stone artefact assemblage because only a few quartzite flakes and one scraper were found (Table 3).

Non-lithic artefacts

A range of botanical remains similar to those described from the other sites were recovered from Nuwekloof Shelter (Tables 3, 4 & 5). These included a few pot sherds (a rim and a lug), a few OES fragments and beads, white glass bead, a shaped feather (probably from an arrow), a few pieces of leather, a tortoise carapace bowl and a small number of bone tools and beads.

DISCUSSION

As is the case with Rautenbach's Cave, it is also difficult to draw in depth conclusion from the small excavation and samples at Nuwekloof Shelter.

It can be speculated from the small excavation and samples, that Nuwekloof Shelter may have been used in a similar way by small groups as was the case at Kleinpoort Shelter. The difference is that *Freezia* sp. was collected in larger quantities and prefered to *Cyperus*

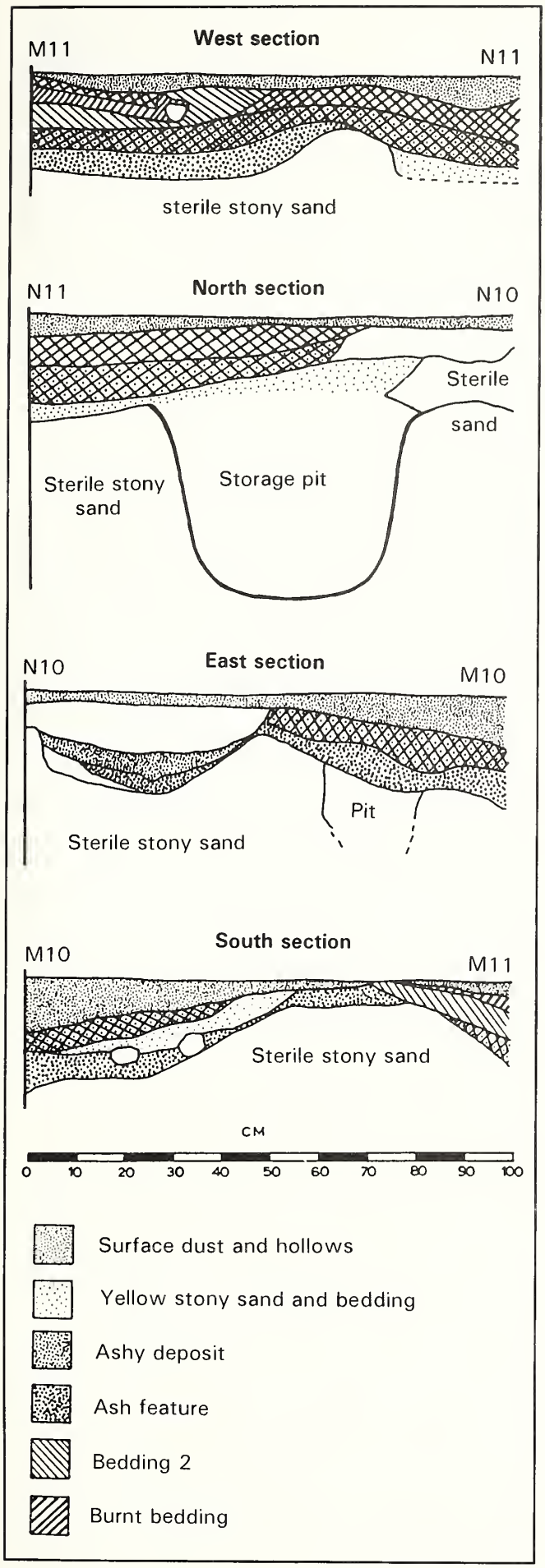

Fig. 18. Section drawing of the test pit excavation at Nuwekloof Shelter.

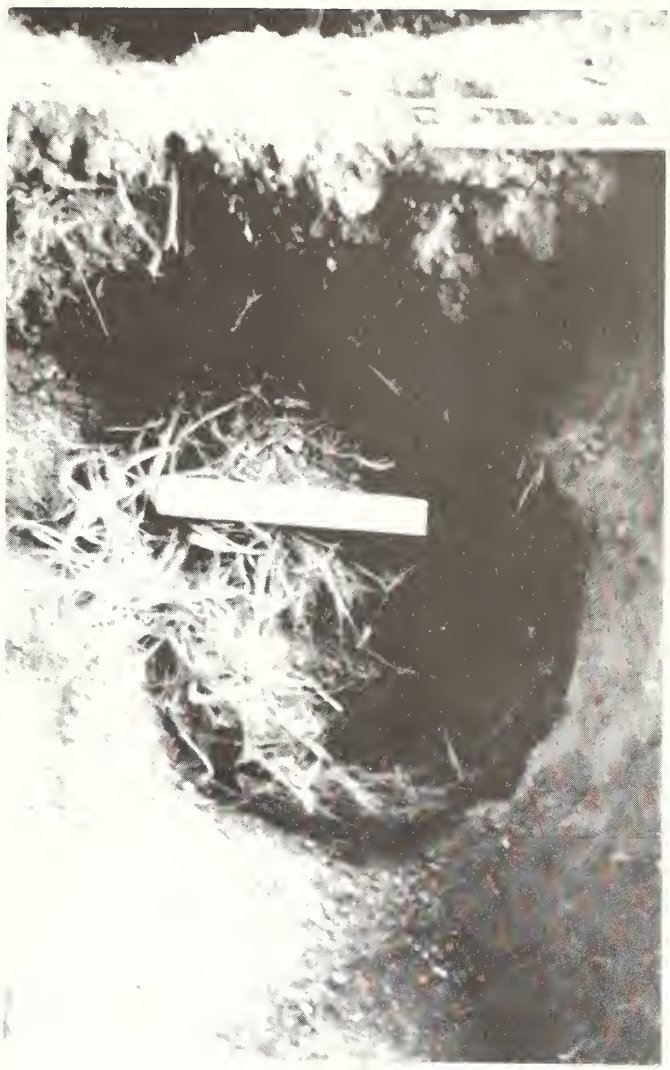

Fig. 19. The storage pit 'sealed' with a grass plug.

usitatus, which was also the bulk of underground plant food collected at Rautenbach's Cave. This may suggest that Nuwekloof was occupied by larger groups and/or for longer periods of time than Kleinpoort Shelter. Although this may have been the case, there is no other evidence to suggest that Nuwekloof Shelter was used for group social activities, i.e. aggregation. In fact, the few cultural items and the absence of formal tools suggests that not much manufacturing of new equipment took place, but the large number of wood shavings on the other hand indicates that some maintenance of existing equipment was carried out instead. Relatively few small animals were trapped and no large animals were hunted.

The data collected from Nuwekloof Shelter, in general, is similar to that recovered from Kleinpoort Shelter. This would suggest that Nuwekloof Shelter was also occupied for short periods of time by small sized family groups during the warmer months, to coincide with the availability of *Freezia* sp.

The large 'sealed' grass lined pit filled with *Pappea capensis* seeds was an interesting find. However, similar storage pits were also reported from other sites outside the Baviaanskloof region.

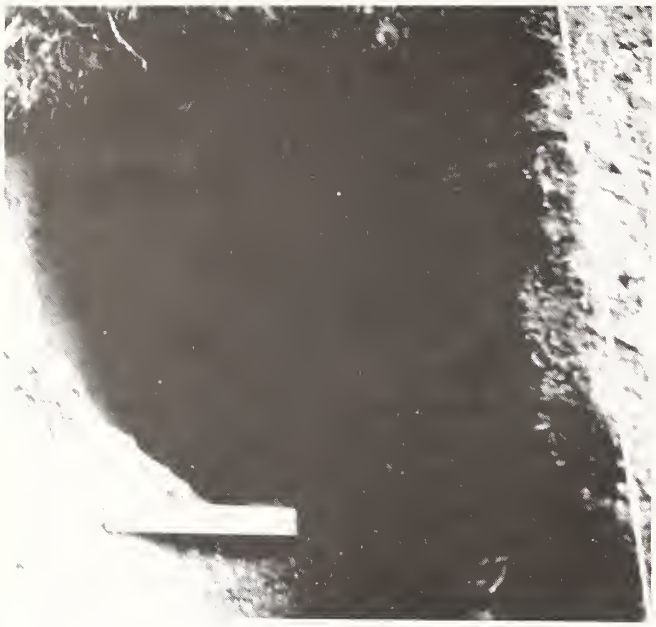

Fig. 20. Storage pit with the contents removed.

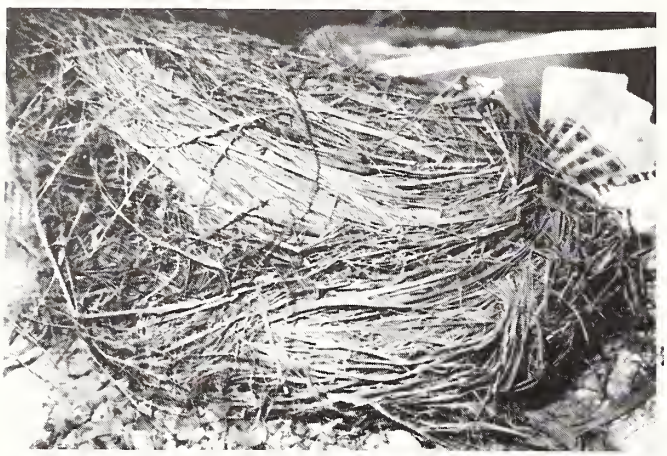

Fig. 21. The grass lining from the storage pit.

Fig. 22. Some of the *Pappea capensis* seeds and other fill removed from the storage pit.

At Boomplaas Cave a cluster of more than 60 pits were found, of which only three retained their contents of *Pappea capensis* seeds. The pits were lined with grass and *Boophane disticha* leaves and a few were marked by painted stones (Deacon, H.J. 1979; Deacon, H.J. & Brooker 1976; Deacon *et al.* 1976; Deacon, J. 1982). The pits had three layers of lining, *B. disticha* followed by grass and a second layer of *B. disticha*. The toxic qualities of *B. disticha* probably helped to protect the contents of the pit against insects (Deacon, J. 1982:103).

The bulk of the seeds found in the pits at Melkhoutboom Cave were *Podocarpus falcatus*, *Calodendrum capense* and *Pappea capensis*. However, Deacon (1976:34) mentioned that the two pits that might have been 'sealed' with covering slabs, contained abundant *P. capensis* seeds.

The pits at Welgeluk and Edgehill Shelters did not yield any seeds or other botanical remains.

The exact age and appearance of storage pits in the Cape Fold Belt is still highly speculative. At Boomplaas Cave their age are estimated at ca 2000 BP (Deacon, H.J. 1979; Deacon, J. 1982). The majority of pits at Melkhoutboom Cave were "in as far as can be established" dug from the sub-surface levels, and a date of younger than 2870 years BP is suggested (Deacon, H.J. 1976:32). The date of 2870 BP comes from the Cut Away Frontal unit which in itself is "an extensive modification to the habitation area of the cave floor" (Deacon, H.J. 1976:26). However, the sub-surface unit did not yield any pottery and the pits therefore probably immediately pre-date the introduction of pastoralists in the region.

The opening of the pit at Edgehill Shelter could not be determined, but an age of ca 2000 BP is suggested. The pit at Welgeluk Shelter dates between 3300 BP and 2519 BP (Hall 1990). The storage pits from the Baviaanskloof region also date from the past ca 2000 years BP and further research is necessary to establish the age of storage in the Cape Mountains.

In general it would appear that *Pappea capensis* was the only or main seed stored throughout the Cape Mountains for later use. This may suggests that the seeds were an important resource (and were in demand) in terms of cosmetic value, exchange, trading or gift relations between individuals or groups.

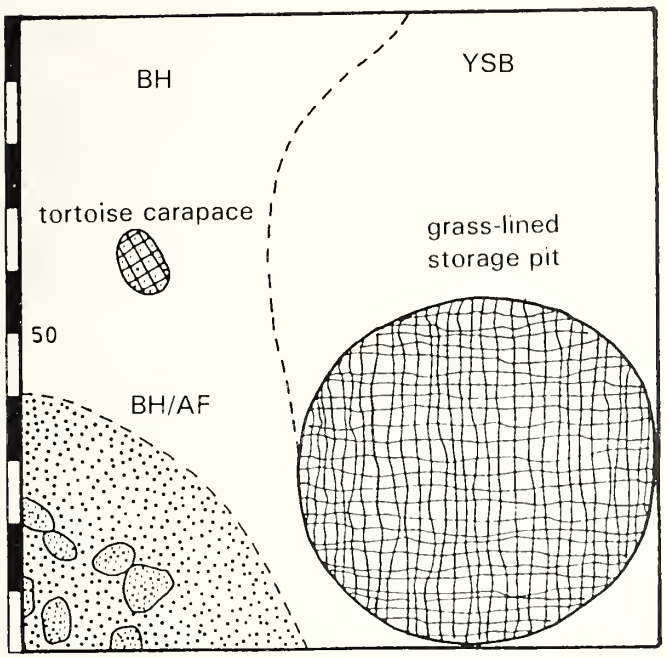

Fig. 23. Plan of the storage pit and overlying deposits.

Fig. 24. Tortoise carapace bowl from Nuwekloof Shelter

An observation made by Wikar, a Swedish soldier who journeyed along the Orange River between 1775-1779, may support this assumption. He reported that Khoisan people used the oil of *Pappea capensis* seeds instead of fat for rubbing themselves. The seeds produce a sweetly scented oil when ground (Mossop 1935). It is therefore possible that the seeds were stored as a source of vegetable oil, *i.e.*, cosmetic use, rather than a food resource (Deacon, H.J. 1976). Thus, storage of these seeds would have increased their value (in terms of social and economic supply/demand) during times when the trees did not produce a harvest.

Unfortunately space only allows for a few brief comments on the possible meanings of storage (Binneman in prep.). In the Koonap River valley, Hall (1990) observed that the appearance of storage pits coincided with increased mussel and fish exploitation. According to Hall, the intensification of food resource exploitation started approximately 4000 years ago. This was brought about by an increase in population which reduced seasonal movement of people.

The value and meaning of storage pits and their contents cannot only be interpreted from an economical point of view. Hall (1990) also suggested that the pits that were marked with painted stones at Boomplaas Cave, may imply ritual importance for the seeds, or marked individual or group property. Storage pits, like the burials, could have been an active method of information exchange of individual or band rights to a specific site and the resources of the immediate region (Hall & Binneman 1987; Hall 1990; Binneman 1996).

I would like to argue that storage pits were made and individually owned by women, because they were the most likely actors to have collected the *Pappea capensis* seeds during their daily plant food collecting trips. They also dug and prepared and lined the pits and placed the seeds in the pits, and in some cases marked the pits with slabs of stone and even painted stones.

Furthermore, these features were part of a deeper symbolic value system used by people (most probably women) in relation to relations of power to bring about transformations and to mark symbolic social space within the living area. Thus, it is possible that the storage pits and the contents signal woman social space within the living area where they were performing 'womens things' like bead making and food preparing.

The association of painted stones with pits at Boomplaas Cave, suggest that they were deliberately placed there not only to mark the pits, but also as a symbolic communication medium, i.e., symbolising womens area. If this was the case, it can be argued that the stones were painted by women shamans in order to retain symbolic power over the contents and social space. By converting "economical capital" - the desire and possible need for certain resources - into "cultural or symbolic capital" (Bourdieu 1990, 1992) women were able to produce and reinforced symbolic power relations and transformations.

To conclude, although Rautenbach's Cave and Nuwekloof Shelter are only some 5 km apart, different socio-economic patterns are visible. The bulk of underground plant food collected at Rautenbach's Cave was *Cyperus usitatus* and at Nuwekloof Shelter *Freezia* sp. Whether this was due to the availability of the food resources in the vicinity of the sites, time of year the sites were occupied or social preferences is difficult to establish. It is possible that larger samples may provide some insights into these specific patterns.

Nevertheless, from data collected at Kleinpoort Shelter it was assumed that small food packages like *Cyperus usitatus* represented small groups and short occupation periods of sites. Larger plant food packages, such as *Watsonia* sp. may suggest that a site was occupied by larger groups and/or for longer periods of time. However, these assumptions proved not to be supported by the data collected at Rautenbach's Cave, while that of Nuwekloof Shelter seems to support the Kleinpoort Shelter scenario.

However, it is also possible that the size of the plant food had nothing to do with group size and length of time stayed at a site, but rather when certain foods resources were available at different places.

ACKNOWLEDGMENTS

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